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Space Vehicles as Thermodynamic Systems

CHALLENGE TO AMERICAN INDUSTRY

"American industry must continue to demonstrate its ability to meet the challenge [of the struggle between communism and democracy]. In general, this means that it must continue a program of expansion commensurate with the growing needs of the population. This will give evidence of a will to act which is one of the two phases of the success of our industrial system. The other phase—the knowledge of what to do—the technological know-how that has made it possible for American industry to lead the world—must be maintained through applied research.

Research characterizes modern industry. It is an inevitable result of the complexity of modern life. Even on a continent as rich as North America, a population of 200,000,000 cannot be maintained on a strictly agricultural economy. The means of production must be more sophisticated."

B. D. Thomas, from an address, "Industrial Research in a Competitive Society", presented before the American Gas Association, Cleveland, April 22, 1958

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BATTELLE TECHNICAL REVIEW

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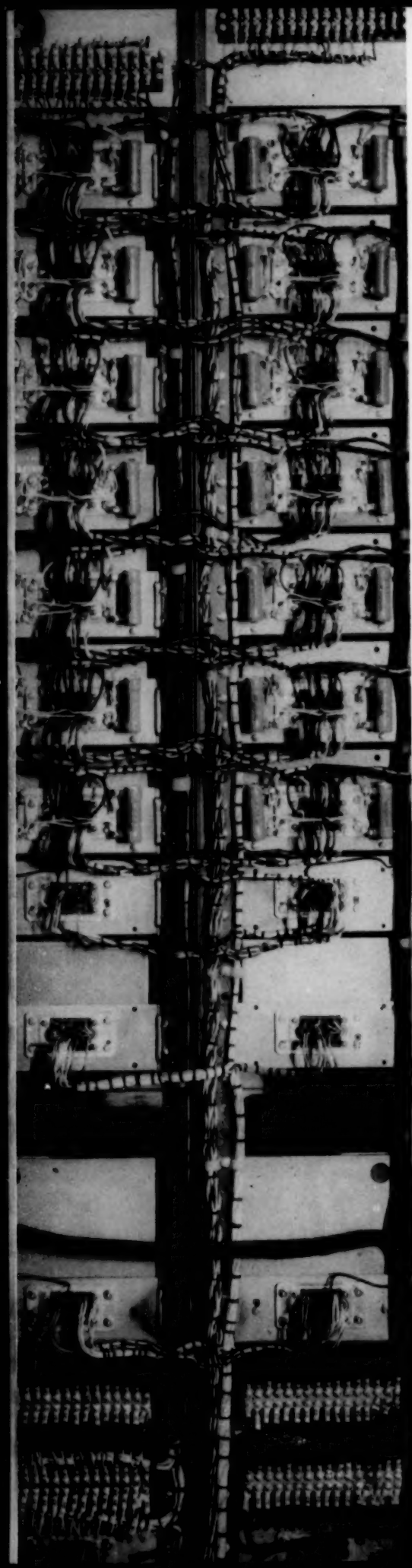

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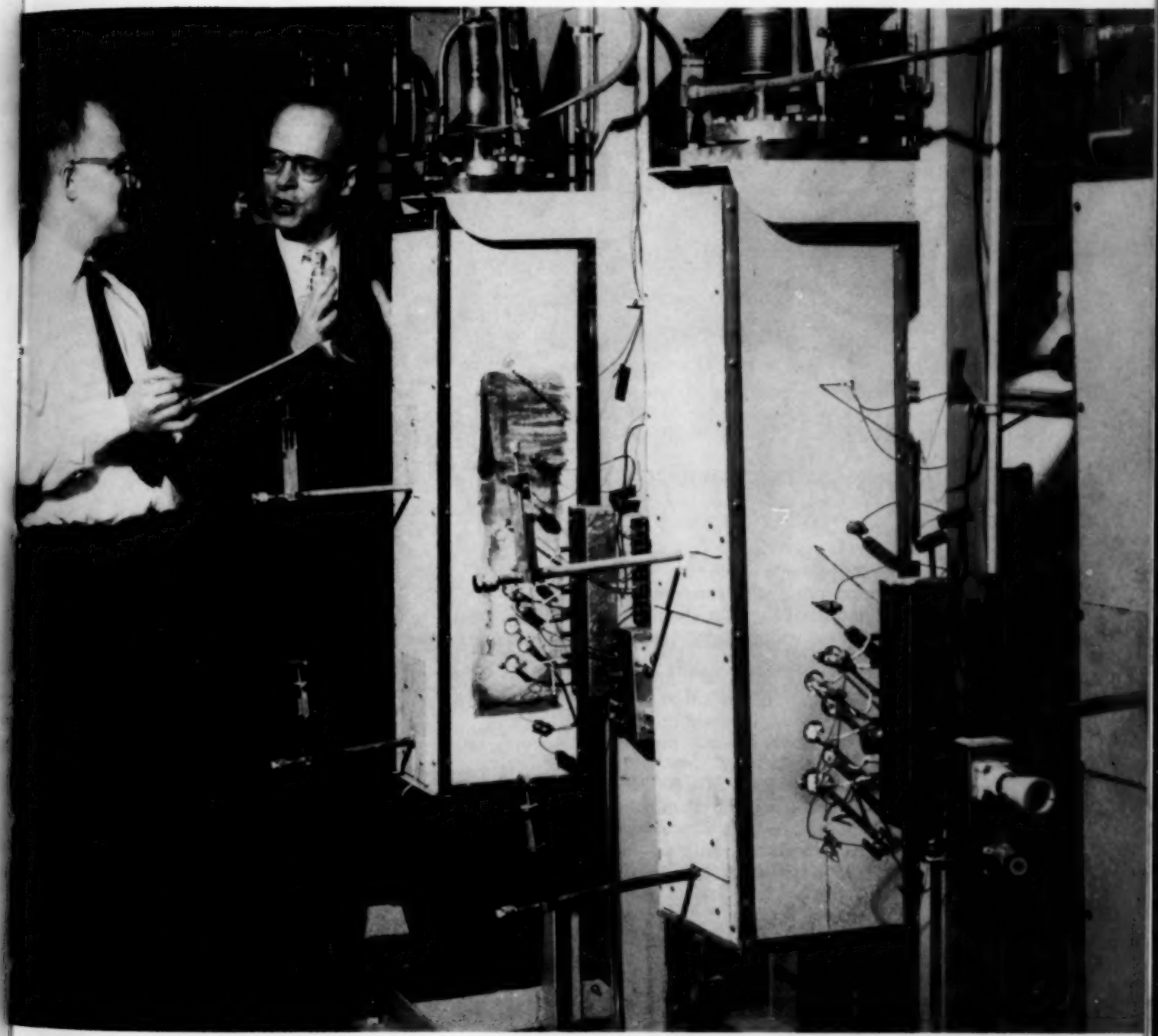
Tantalum is known as a metal that stands up well under corrosive atmospheres. To gain a more complete knowledge of the metal's corrosion-resistant properties, specimens are subjected to extreme conditions in this battery of creep-corrosion units. These conditions include exposure to attack by sodium at 1200 F while the metal is under stress.



TORTURE FOR TANTALUM

VIGNETTE

BEARINGS TECHNOLOGIST

C. Malcolm Allen

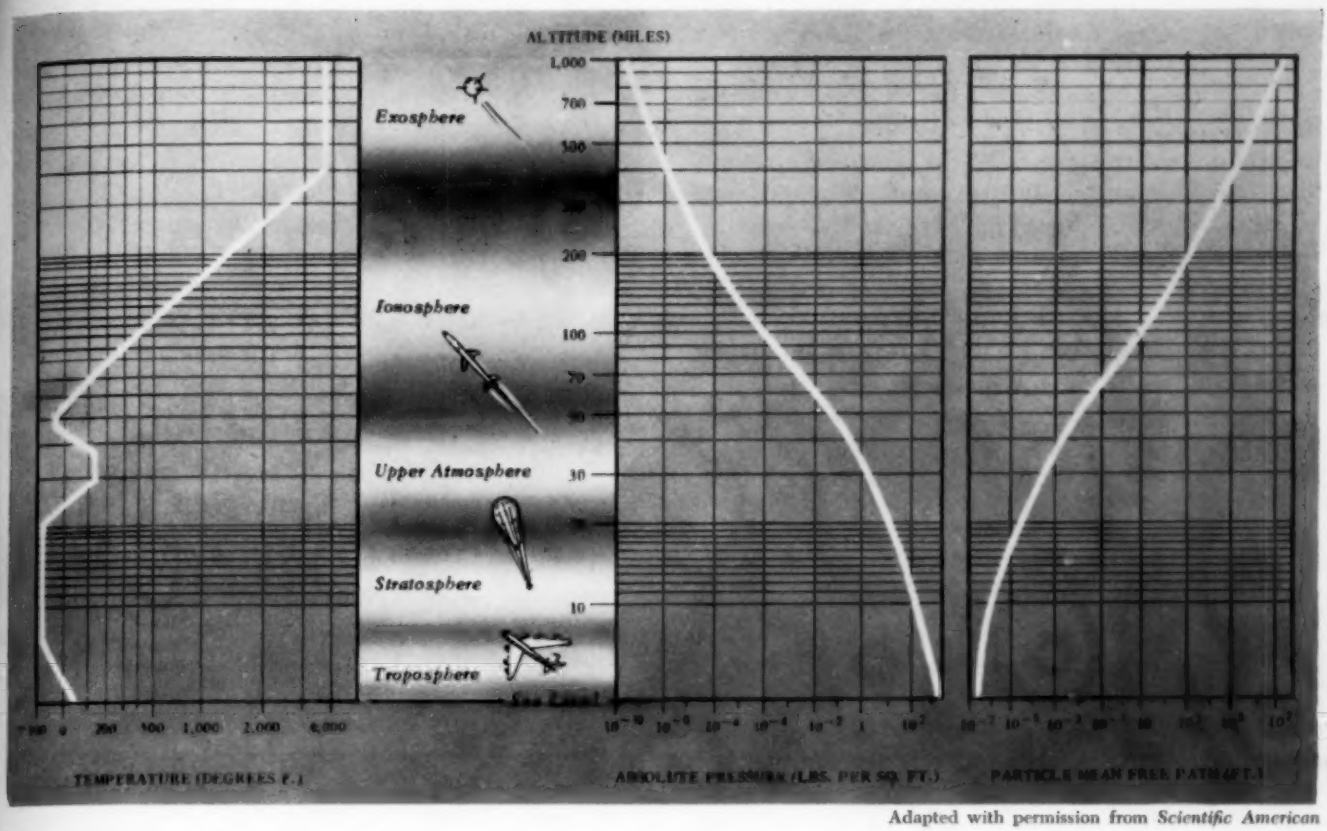
Jet- and rocket-powered air vehicles have created a host of research problems, none more critical than the development of bearings that will stand up under high temperatures and speeds. C. Malcolm Allen, who guides much of Battelle's research on bearings, believes that airframe bearings will have to operate at temperatures up to 2000 F, while bearings in propulsion systems may soon be subjected to temperatures of 1500 F and higher. The problems of finding materials and designing bearings that will operate under such punishing conditions have occupied Mal for many years. Solving the problems requires him to seek out and integrate knowledge from numerous fields of technology.

Among his studies have been those on sleeve-bearing behavior, the chemical and physical aspects of the lubrication of sliding contact and high-speed rolling-contact bearings; and the behavior of ceramic and cermet materials in rubbing contact at elevated temperatures. Mal has been associated also with the development of aluminum alloys for bearings, research on main-shaft bearings for aircraft turbine engines, the design of sliding-contact bearings, and the development of bearing materials for nuclear applications. One of his current interests is the development of seals to operate at high temperatures, speeds, and pressures.

Mal has reported some of the results of his research in more than a dozen articles and papers. His professional activities also include membership in the American Society of Lubrication Engineers and the Society of Automotive Engineers. He is chairman of the Subcommittee on Sliding Contact Bearings of the ASLE and a member of its Technical Committee on Bearings and Bearing Lubrication. He is vice chairman of the Central Ohio Chapter of the ASLE. Mal is also a member of the Aircraft Power Plant Activity Committee of SAE.

Mal received his bachelor of engineering degree in mechanical engineering from the University of Toledo. Prior to joining the Battelle staff, he served with the Emerson Electric Company as an experimental engineer and later he was associated with the Lycoming Aircraft Company.

Two active sons help to keep Mal and his wife Ruth busy. Nevertheless, they find time to enjoy their hi-fi tape recordings between gardening tasks and look forward to many long trips when the boys are older.



Adapted with permission from *Scientific American*

The chart shows approximate data on temperature, density, and pressure variations in the earth's atmosphere relative to altitude.

Space Vehicles As Thermodynamic Systems

Thermodynamics has an important place in the solution of many of the problems of space travel. The authors discuss the thermodynamic characteristics of space vehicles in relation to their environment and consider the refinements in basic thermodynamic concepts required to cope with problems of space flight.

by Albert E. Weller, Jr.
and Frederick L. Bagby, Jr.

The launching of earth satellite vehicles has marked man's initial venture into space. If the lessons of past history can be relied upon, it is certain that this first venture is but the bare start of a new era of exploration whose ultimate consequence to society, and whose impact on science and technology, cannot presently be foreseen. Some of the areas in science and technology that will both facilitate space progress and profoundly influence such exploration can already be defined. One of these areas is the engineering science of thermodynamics — the body of knowledge concerned with energy and its transformations.

Practical application of thermodynamics to the design of heavier-than-air flight vehicles extends back to the earliest days of flight. To the present, these applications have fallen generally into two categories: one is that of power generation for propulsion and auxiliary power; the second includes the environmental control systems required for the heating or cooling of vehicle interiors and components. The need for con-

tinued and even radical advances in thermodynamics in these areas for use in space vehicles cannot be overemphasized. Nevertheless, a third category of applied thermodynamics—consideration of a vehicle and its thermal relation with its surroundings as a thermodynamic system—has assumed importance with the advent of supersonic and hypersonic flight vehicles. This category will demand equal consideration with the first two categories in space vehicle design. This article briefly outlines the refinement in basic concepts that will be required to cope with thermodynamic problems of space flight and discusses the thermodynamic characteristics of vehicle passing through planetary atmospheres and when in interplanetary space.

Basic Thermodynamic Concepts

The demands of modern technology, even before space flight loomed as feasible, have far outstripped the ability of formal or classical thermodynamics to provide analytical solutions to many problems. While classical thermodynamics deals only with the equilibrium conditions relating to such problems as temperature, pressure, and volume, many practical problems require the introduction of concepts based on kinetic effects. This is particularly true when problems require a knowledge of the rate or speed at which some processes of energy transformation occur.

Rate problems of the latter type may be treated rigorously from the molecular kinetic viewpoint, which in principle considers the individual motions and properties of each molecule and atom within a thermodynamic system. However, the complexity of such an approach has discouraged its general application. For most practical problems, such as those dealing with heat transfer and the flow of real fluids, technologists have found it necessary to combine the variables of classical thermodynamics with empirical factors determined by experiment in order to obtain useful engineering solutions.

A formal science, called irreversible thermodynamics, that can be applied to kinetic problems is now being developed, though it is still in a rudimentary state. A complete theory of irreversible thermodynamics, capable of solving problems involving rates, friction, chemical reactions, and other irreversible processes does not exist. Therefore, the study of energy transformations in new situations, such as will occur in space flight, can be accomplished only by either the extrapolation of empirical factors determined in known situations, or experiments in the actual field of application. Both approaches are being used in the analysis of problems encountered in the design of space vehicles. Unfortunately, the results of extrapolation into new fields are never certain, and, ultimately, experiments will be required to confirm the results. In the case of space flight, these experiments will be costly and time consuming. Hence, the need to accelerate basic thermodynamic studies can be well justified from the standpoint of the large benefit that will occur in the engineering of practical space vehicles.

Aerothermodynamics

The term "aerothermodynamics" in its strict sense has been established to identify the interrelated problems of aerodynamics, gas dynamics, and heat transfer encountered during supersonic and hypersonic flight in the earth's atmosphere. Scientists and engineers are presently immersed in the subject of aerothermodynamics as a result of their efforts to design ballistic, boost-glide, and orbital vehicles that will maintain structural integrity when subjected to aerodynamic heating during exit and re-entry through the earth's atmosphere.

Passage of space vehicles through the gaseous media surrounding the earth and other planets of our solar system obviously will create one of the thermodynamic

Albert Weller's participation in studies involving heat transfer and fluid dynamics has naturally given him an interest in the thermodynamic problems concerned with space vehicles. Since his association with Battelle, Weller has investigated problems involving heat transfer from a supersonic stream in rocket motors, including a study of their use in the heating of metals. His research on combustion has included the study of low-pressure flames and problems associated with the ignition of atomized liquid fuels.

The thermodynamics of space flight is closely associated with Frederick Bagby's interest in and responsibility for research on the aerodynamics and propulsion of aircraft and guided missiles. He is also concerned with the relation of these problems to air-weapon systems development. Bagby's earlier research involving thermodynamics included studies relating to the efficiency of residential heating equipment. Before joining Battelle, he served as a production-design engineer with Curtiss-Wright Corporation's Airplane Division.

problems of the space-flight age. Since the physical characteristics and chemical compositions of various planetary atmospheres differ, use of the term aerothermodynamics in a generic sense for space flight is not precisely correct. The broad nature of the problem would better be described as one of thermo-gas dynamics. Nevertheless, the knowledge gained and the techniques evolved in the course of mastering the field of aerothermodynamics in the earth's atmosphere will provide the foundation upon which details of exit and re-entry through the atmospheres of other planets will ultimately be resolved.

Exit and Re-entry Through Earth's Atmosphere

The ever-increasing volume of literature on aerothermodynamics is evidence of our substantial progress in understanding certain aspects of the problem as it relates to the earth's atmosphere. Scientists have been most concerned with flow around, and heat transfer to, bodies under conditions of continuum flow—encountered at altitudes up to about 60 miles. A number of authors have outlined the chemical and thermodynamic variables that must be taken into account in hypersonic continuum flow analysis. Their studies have added to our knowledge of the temperature, pressure, enthalpy, chemical state of air in the stagnation region, boundary layer, and nonviscous flow fields behind strong shock waves. The knowledge is important because these factors, in combination with the vehicle flight path, must be considered by the designers in determining both the total amounts of heat and localized rates of heat transfer that space vehicles must undergo in exit and re-entry through an atmosphere.

If consideration of the problems of flow and heat transfer is confined to vehicles which maintain the integrity of their structural surfaces (for which no allowance need be made for mass transfer phenomena such as melting or ablation), present knowledge can show that the heat transferred to the vehicle surface by aerodynamic heating is proportional to the ratio of skin friction to the total drag of the vehicle. Thus, from the thermodynamic standpoint, when comparing vehicles of equal gross weight and flight speed, less heat will be transferred to vehicles with high-drag blunt shapes during re-entry. Available knowledge also demonstrates that the localized region of highest heat transfer for flight vehicles will generally be the stagnation zones on noses and leading edges. Here again, the rates of local heat transfer are reduced by increasing the bluntness of the local body shape. This knowledge has led scientists to concentrate on the study of flow around, and heat transfer to, blunt bodies. We should note in this connection, that even the points or front

Probable Characteristics of Moon and Planet Atmospheres from Aerothermodynamics Viewpoint

Planet	*Probable Composition of Atmosphere*	*Approximate Exit and Re-entry Characteristics*
Mercury	Essentially none	———
Venus	Probably CO_2. Existence of N_2 uncertain	Comparable to passage through earth's atmosphere
Mars	Probably mostly N_2 with traces of O_2, and H_2O	Less severe than passage through earth's atmosphere because of lower gravitational forces, and lower density of the atmosphere.
Jupiter	Probably mostly H_2 and He with substantial amounts of CH_4 and NH_3	Probably much more severe than passage through earth's atmosphere because of large gravitational forces, and great depth of the atmosphere
Uranus	Mostly H_2 and possibly He with substantial amounts of CH_4	Uncertain
Neptune	Probably mostly H_2 and He with substantial amounts of CH_4	Uncertain
Pluto	Probably has some atmosphere but composition unknown	Uncertain
Moon	Essentially none	———

edges of streamlined, slender body shapes are not actually sharp, but are rather, in the true physical sense, somewhat blunted.

Generally speaking, as a result of extended theoretical and experimental studies during recent years, workers in the field can predict heat-transfer rates in stagnation regions of blunt bodies to an engineering order of accuracy over a wide range of flight speeds. Furthermore, they can, with reasonable accuracy, predict the heat-transfer rates at other points on blunt bodies for cases where either laminar or turbulent boundary layers exist. However, other aerothermodynamic problems are still to be solved. In these studies, the shock tube is an invaluable experimental device, although the old reliable techniques of flight tests, wind tunnels, and ballistic ranges also play useful roles.

In some areas, aerothermodynamicists have the requisite basic knowledge and are now concerned primarily with problems of engineering refinement. Determining whether boundary layers downstream of the stagnation region are at chemical equilibrium or are "frozen" in the sense that the air molecules that may be dissociated and ionized during passage through a shock wave remain so, is one of these areas. Another area of interest is the question of whether vehicle sur-

faces are catalytic or noncatalytic with respect to the recombination of the dissociated or ionized air. Other problems requiring study are the nature of the mixed subsonic-supersonic flows in the nonviscous flow region around blunt bodies and the effect of the boundary layer on the flow field both at the front portion and downstream on slender body shapes.

There are, of course, several facets of the problem that still challenge the scientists. Transition from laminar to turbulent boundary layer flow is a continuing problem in hypersonics, as it has been in the lower speed-flow regimes. We now have the additional complication, however, that heat-transfer rates through turbulent boundary layers are several times higher than through laminar boundary layers. Such an increased heat-transfer rate can lead to definite localized structural design problems. The whole subject of mass-transfer cooling for vehicles, be it by transpiration, ablation, vaporization, sublimation, or surface-combustion techniques, also needs extensive study.

Altitude and Aerothermodynamics

In contrast to the situation in the region of continuum flow, below 60 miles altitude, flight at altitudes greater than this is characterized by negligible values of aerodynamic lift and aerodynamic heating. At such altitudes, the density of the gaseous medium is so low that collisions between molecules of the gas are infrequent, and the concepts of continuum flow can no longer be applied.

The approximate variation of temperature with altitude, for the earth's atmosphere is shown in the chart on page 3. In the region of continuum flow, the atmospheric temperatures vary within narrow limits and are low when compared with the temperatures that occur in hypersonic shock waves and boundary layers. This fact provides evidence that the importance of atmospheric temperature in the realm of continuum flow is not of major significance, and explains why the subject has not been discussed previously.

Although the temperature reaches about 4000 F in the region above about 60 miles, the fact is of secondary importance. The temperature represents the energy of molecular motion, but because of the low density, only a small amount of heat is available for transfer to a vehicle.

At ultra-high altitudes, a minimum temperature, or energy of molecular motion, exists by virtue of the fact that the molecules, unaffected by collisions with the other molecules, must move in orbits about the earth. The terms "slip" and "free molecule flow" are used to describe flight conditions at these extreme altitudes.

Temperature Assumed By An Inert Sphere At Various Distances From The Sun

Location	*Temperature F*
Venus	131
Earth	43
Mars	—53
Jupiter	—240
Interstellar Space	—454

Only a start has been made in the study of these facets of rarefied gas dynamics wherein the problem becomes one of the interaction of individual particles and the vehicle surface. Phenomena such as sputtering, in which the impact of a single molecule supplies sufficient energy to evaporate a number of atoms in the vehicle skin, may occur. Because of the absence of a shielding atmosphere small solid particles called "micrometeorites" can strike a vehicle at extremely high velocities, erode its surface, and possibly penetrate its skin. The absence of an atmosphere also allows cosmic rays, which are atomic nuclei traveling at velocities approaching the speed of light, to strike the space vehicle. The effects of these phenomena on a space vehicle and its occupants are imperfectly understood. Various unmanned satellite experiments will provide much of the information necessary to evaluate these hazards. The information so obtained should make it possible for engineers to solve many problems encountered in space flight.

The important feature which distinguishes flight in the slip and free molecule flow regions from flight in the region of continuum flow is that the interaction of the vehicle with its particle environment occurs as discrete atomic events. Gross effects appear only from the accumulation of such atomic events over long periods of time. The general problem represents a good example of the need for the development of the molecular kinetic concept of irreversible thermodynamics.

Exit and Re-entry Problems on Other Planets

Discussion of exit and re-entry through the atmospheres of planets other than Earth can be only speculative at present. We have several methods for determining whether an atmosphere is present on a planet. Of these, spectroscopic techniques are the most useful. Unfortunately, gases such as hydrogen and helium are not detectable spectroscopically, and their presence on some planets is postulated by indirect means. However, such limited information is not adequate to establish facts about planetary atmospheres sufficient

for engineering purposes. Data on such matters as the depths and the density, pressure, and temperature variations of atmospheres are also needed. At present only scattered data, of limited accuracy, are available on these latter characteristics of the atmospheres of the planets other than the earth.

The available information on the atmospheres of the planets in our solar system, plus that for the moon, is briefly outlined in the table on page 5. The planets can be divided into two groups: one is the terrestrial group including Mercury, Venus, Earth, and Mars; the other is the Jovian group including Jupiter, Saturn, Uranus, Neptune, and Pluto. The terrestrial planets have oxidizing types of atmospheres, while the Jovian are characterized by reducing types of atmospheres. The table also suggests the severity of aerothermodynamic problems for flight through the atmospheres of Venus, Mars, and Jupiter as compared with exit and re-entry through the earth's atmosphere. The problems of exit and re-entry from the earth's atmosphere are shown to be roughly comparable to those for Venus, more severe than those for Mars, and probably much less severe than those for Jupiter. As a general conclusion, it is possible to state that the problems of exit and re-entry through the earth's atmosphere undoubtedly will be resolved. Furthermore, the research and development of techniques applied to the solution of problems in the earth's atmosphere can be adapted for study of other planetary atmospheres, once precise data on these other planetary atmospheres become available.

A Vehicle in Space

From the viewpoint of thermodynamics, a flight vehicle in space will receive or dissipate substantial amounts of energy almost exclusively by means of radiation. Thus the relation of a space vehicle to its environment, when outside of planetary atmospheres, will be dominated by the local thermal radiation field.

Wave Length of Maximum Intensity of Radiation As A Function of Temperature

Wave Length of Visible Radiation = 0.4 - 0.7

Temperature, F	*Wave Length, Microns*
32	10.5
81	9.6
212	7.7
932	3.7
1,832	2.3
10,800 (sun)	0.48

Within our solar system, the major source of thermal radiation is the sun. At the location of the earth's orbit, its radiation amounts to an energy flux of 445 Btu/ft^2 hr. This energy flux varies inversely with the square of the distance from the sun. In addition to the radiation coming directly from the sun, some solar radiation is reflected from the planets, and some thermal radiation is emitted directly from the planets. Such radiant energy is of little consequence except within a few planetary diameters of a source.

The table on page 6 shows the temperatures assumed by an inert sphere at various distances from the sun. A space vehicle, however, not being an inert body, is not likely to be allowed to passively assume the local equilibrium temperature. Such a vehicle will generate a certain amount of internal energy because of the heat created by the crew and the operation of internal instruments, propulsion and power systems, and other machinery.

At the same time, the presence of men and machinery requires that the internal temperature of the vehicle be not too different from that found at the earth's surface. Depending on its location in the solar system, the vehicle's temperature may have to be maintained above or below the local equilibrium temperature, requiring the heating or cooling of its interior. This could be done by installing insulation to conserve heat, or by employing a heat pump to transfer heat from the vehicle interior to the vehicle surface where it would be lost by radiation. However, such approaches add to the weight and complexity of the vehicle.

Fortunately, still another method exists for controlling the exchange of energy between the vehicle and its environment. This method, utilizing the principle of radiation, is based on the fact that a surface may respond differently to radiations of different wave lengths. The wave length of thermal radiation, that is, radiation emitted from a hot surface, depends upon the temperature of the surface. The wave length at which the maximum amount of energy is radiated decreases as the temperature is increased.

The adjacent table shows the wave lengths corresponding to maximum radiation for different temperatures. The important fact pointed up by this table is the great difference between the wave lengths emitted by a relatively cool body, such as a space vehicle, and by a hot body such as the sun. The ability of a surface to reflect, absorb, or emit radiation may be quite different at such widely different wave lengths. The energy being received by a vehicle would be largely short wave length radiation from the sun, while the energy a vehicle emits would be in much longer wave lengths.

By choosing a surface that has the proper reflecting and emitting characteristics at these two wave lengths, the temperature of the vehicle can be made higher or lower than the local equilibrium temperature. For example, most polished metals reflect short wave length radiation while having, at the same time, a relatively high ability to emit long wave lengths. A vehicle with a polished metal surface would therefore assume a temperature lower than the local equilibrium temperature. Materials which exhibit the opposite characteristics and some which respond nearly uniformly to radiation of all wave lengths, are also available.

The well-known laws of thermodynamics specify that self-contained thermodynamic systems must operate with an efficiency of less than 100 per cent. Put another way, the energy inherent in a cycle must be dissipated and replaced by energy from a source of higher availability. Such items as propulsion, internal heating and cooling, and the generation of food and oxygen for men in manned vehicles are examples of self-contained thermodynamic systems that fall into the two categories briefly described at the beginning of the article. However, the energy balance of a space vehicle must account for this energy. With an average energy expenditure per man of about 680 Btu/hr, 1700 Btu/hr will be required from some auxiliary power source if a 40 per cent efficiency in converting waste products to food and oxygen is obtained. A value of 40 per cent is about the maximum efficiency that has been observed in photosynthesis. Practical efficiencies would be smaller. All of this energy must be dissipated from the vehicle, and in addition, the radiation adsorbed from the sun must be taken into account. In the vicinity of the earth, or still farther from the sun, there is no particular difficulty in radiating the required energy. Minor adjustments to the infrared and visible emissivities will be sufficient to maintain a thermal balance. In the vicinity of Venus, however, control of the vehicle temperature may become difficult.

Looking to the Future

The foregoing discussions of a space vehicle and its thermodynamic relation with its surroundings illustrate that nothing in the way of new scientific principles is involved. Rather, the need is for extensive refinement of analytical engineering techniques, and for the accumulation of additional experimental data that can be combined with improved analytical techniques to permit rapid, precise solutions of the thermodynamic problem discussed. As mentioned early in this article, much basic research is required; the challenge will be to create ingenious theoretical approaches to the problem and to devise useful, low-cost laboratory-scale experiments that are meaningful. A proper foundation of basic knowledge should then permit the wise selection of the large-scale experimental and development programs that will be required to finally verify and demonstrate the practicality of various proposed solutions. Technical areas of interest will center on the high-temperature chemistry of gases, heat transfer by radiation and by conduction and convection in gases, and on the interplay of materials properties on heat transfer and high-temperature chemistry.

THE SCIENTIST—CAREFUL BUILDER

"The scientist is a practical man and his are practical aims. He does not speak of the *ultimate* but the *proximate*. He does not speak of the last analysis but rather of the next approximation. His are not those beautiful structures so delicately designed that a single flaw may cause the collapse of the whole. The scientists builds slowly and with a gross but solid kind of masonry. If dissatisfied with any of his work, even if it be near the very foundations, he can replace that part without damage to the remainder. On the whole, he is satisfied with his work, for while science may never be wholly right, it certainly is never wholly wrong; and it seems to be improving from decade to decade."

Gilbert N. Lewis, *The Anatomy of Science*

Resource Studies: Key to Water Planning

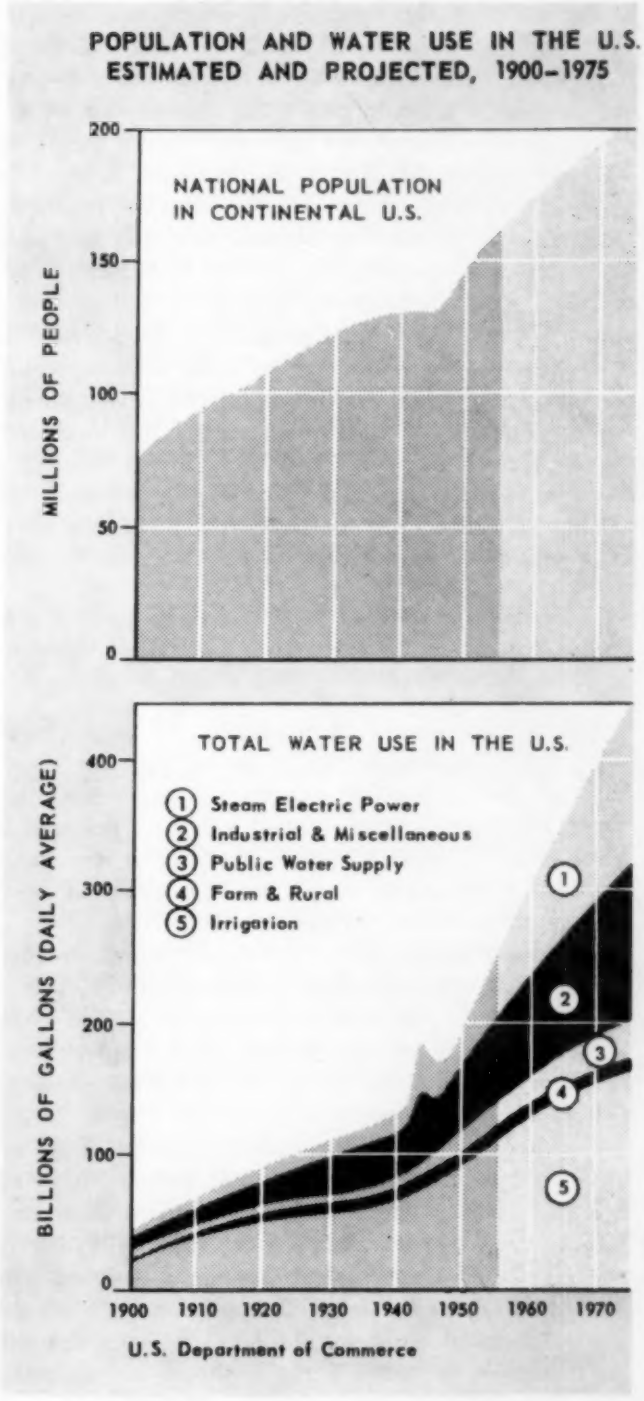
by Robert C. Smith

The steep rise in water demand calls for continual improvement in the planning and management of water use in the United States. Modern science and technology can provide much of the knowledge for accomplishing this.

"You never know the value of water until the well goes dry." This familiar phrase, often lightly quoted, has taken on new significance in many parts of the United States in recent years. These years have seen many municipalities forced to restrict the use of water. Industries have had to curtail production because of a shortage of water. During the same period, irrigation wells, especially in the southwest, had to be repeatedly deepened to follow declining water levels, and salt water began to intrude into some underground fresh water supplies along the sea coasts.

In view of the increasing number of water shortage and supply problems, it might appear that the amount of water available to us is diminishing. Rainfall and stream-flow records of the United States Weather Bureau and the Geological Survey disprove this, their records showing no long-term trend either downward or upward in the nation's gross supply of water.

Water utilization records, on the other hand, show a rapid upward trend. A 1956 U. S. Department of Commerce Bulletin (issued by the Business and Defense Services Administration), "Summary of Information on Water Use in the United States, 1900-1975", by Walter L. Picton, presents some revealing



figures. In 1955 the estimated total use* and consumption of water in the United States was six times larger than it had been in 1900. Even more significant

*Though we shall speak of water "use" hereafter, the term should be interpreted as including "consumption". "Use" technically applies to water utilized by industries and communities, most of which is eventually returned to streams and bodies of water after purification—and sometimes without that desirable step. On the other hand, water utilized for irrigation purposes is "consumed"; that is, it is not available for further use. As shown in the graph on this page, almost half of our water is consumed by agriculture.

is the fact that the total doubled between 1940 to 1955, and the growth still continues. In 1955, water usage had climbed an additional 62 billion gallons a day above the 1950 figure. At the present rate of increase, by 1975 the nation's daily water needs will have increased almost 200 billion gallons more.

Since the gross water supply remains constant, though water demands are skyrocketing, the only possible answer to the problem appears to be additional use and reuse of the existing supply. Modern technology, based upon recent progress in the science of hydrology, can do much to provide the high degree of efficiency that will be required in the development, control, and use of water resources if the increased demands are to be met.

Water supply includes, of course, problems of quality as well as quantity. And though quality is of extreme importance in some areas, it will not be considered in this article.

The Hydrologic Cycle

The ultimate source of practically our entire fresh water supply is precipitation in the form of rain, snow, ice, and dew. A possible exception is water from demineralization processes. Though extensive research is going on in this field, it appears that only a very small fraction of our water supply will be obtained from such sources for years to come.

Our water supply, the water in the lakes, streams, and beneath the ground, is continually moving as a part of a great cycle—the hydrologic cycle. This cycle is the path taken by a drop of water as it moves from the atmosphere to the ground or to bodies of water and back to the atmosphere.

The paths taken by the countless drops of water, after they reach the ground, differ greatly. Some of the water may evaporate immediately and thus complete the cycle quickly. Some of the water falls directly into ponds, lakes, and streams and either evaporates or flows toward the oceans. Other portions run off the land surfaces into streams and lakes, or enter the soil. Of the latter, a part will replenish the soil moisture and eventually be evaporated or transpired to the atmosphere by the plants. The remainder of the water that enters the soil percolates downward to become ground water.

The ground-water reservoirs, like surface bodies of water, are not static but are continually discharging or being recharged. Ground-water discharge seeps into the streams at rates that vary according to the quantity of water in storage. In fact, this discharge constitutes most of the dry-weather flow of streams.

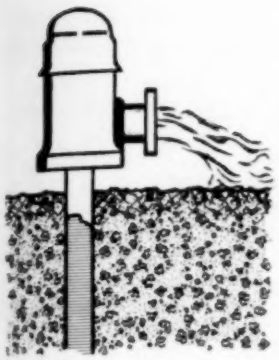
The amount of water following any one of the hydrologic paths depends on many factors. Much of the precipitation, after long periods of dry weather, will be absorbed by the soil. In areas of tight, impervious clay beds or rocks, much of the precipitation will drain into surface bodies of water. In areas of rugged topography, much of the precipitation will flow quickly down the sloping ground and enter the streams; a large part of the water that does enter the ground, moreover, will soon discharge from the hillsides as spring water or seepage. In areas underlaid by porous material, a higher percentage of the precipitation will become ground water. In flat areas, the water tends to gather into ponds which gives it more time both to percolate downward and to evaporate. Thus, the amount of water available in any one area depends upon the amount and the distribution of the precipitation, the topography, and the geology of the area.

Man's needs for water must be met by using it in transit. He must get it either from the underground reservoirs or the surface streams and lakes. He can do this by modifying the local physical factors so that the water delivered by the hydrologic cycle can be stored and distributed where and when he needs it. If this is impossible, he must adjust his needs to fit the amount of water delivered. The ability to modify the physical factors enough to meet the needs requires an extensive knowledge of the local physical conditions, a knowledge based upon hydrologic concepts.

Underground Water Sources

In 1861, an Ohio judge considered a case involving two adjacent well fields and their interference with one another. He attempted to approach a decision about who was damaging whom by comparing the

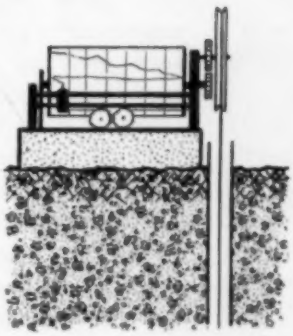
The author, who was Assistant Chief of the Ohio Division of Water before joining Battelle, has been associated with many areas of water study. These have included problems concerned with ground-water resources, flooding and landslides, watershed-planning programs, municipal and industrial water supplies, and studies of water-rights law for legislative consideration. He was the gubernatorial appointee as Secretary of the Advisory Committee on Ohio's Water Resources during the years 1954 and 1955. Earlier Smith was associated with the Water Resources Division of the U. S. Geological Survey, serving for several years as District Geologist for West Virginia. He is author of almost a score of publications relating to water problems.



water underground to water flowing in a stream on the surface of the ground. He apparently reasoned that if the underground water were in the form of an underground river, the common law relating to use of water from rivers and streams (a doctrine of equal rights) could be applied. But before the doctrine could be related to underground water, the judge felt that "The subterranean stream must be recognizable as such from the surface, by men of ordinary learning and powers of observation, without excavation, and without the abstruse reasoning of scientific persons". He evidently believed, moreover, that there was little chance of most underground water ever being so recognized, because later in the same decision he stated: ". . . the existence, origin, movement, and course of percolating waters and the causes which govern and direct their movements are so secret, occult, and concealed that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty."

However convincing this reasoning may appear, knowledge of the occurrence, source, and movement of underground water has been advanced by "scientific persons" far beyond the willow-wand concept of 1861. If water moving underground has an aura of mystery, it is largely because such water can't be seen. Today, with water-resource research and modern water technology, underground sources can be charted almost as accurately as if they could be seen.

The rocks that form the crust of the earth are seldom solid throughout. They contain numerous open spaces which range in size from microscopic passages to large caverns. Moreover, there are many kinds of rocks and many variations in the number, character, and arrangement of the open spaces. Inasmuch as the character of the rocks in any given area is the result of its geologic history, the occurrence and amount of ground water in any area is also the outgrowth of that history. Consequently, the sciences of geology and geophysics are very important facets of ground-water study.



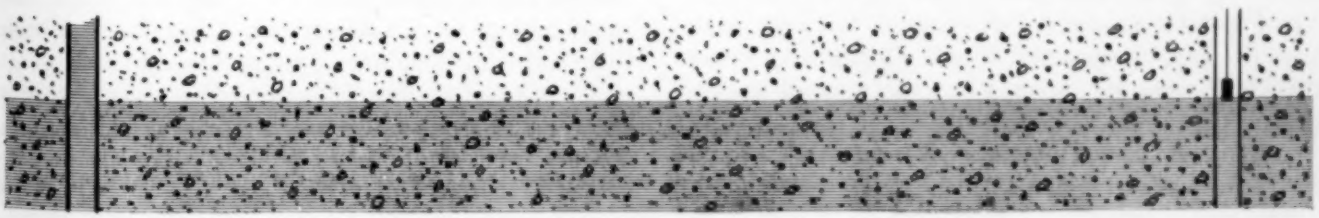
Just as a study of any surface implies consideration of the subsurface, a study of the surficial geology of a region will generally bring to light the presence of any underground reservoirs. Additional geologic study of more favorable areas may involve such steps as test drilling, electric well-logging, and sometimes seismic or other geophysical exploration. Techniques of these types can pinpoint underground reservoirs and provide information as to thickness, extent, and water recharge area. They can also reveal the ability of the subsurface to transmit water.

In some cases geologic study is all that is required. Wherever an investigation reveals an underground reservoir extensive enough to more than satisfy immediate needs, no further research is really necessary. On the other hand, it may be desirable to determine the full supply that the reservoir can deliver. This information, too, can be obtained by making full use of the sciences of hydrology, physics, and mathematics.

Evaluating Underground Water Sources

When a well is pumped, water enters from all sides. At first, water is withdrawn only from storage near the well, and the water level in the underground reservoir recedes in the form of an inverted cone around the well. As pumping continues, water flows to the well from progressively greater distances, and the reservoir water level continues to recede. The cone also continues to expand until it intercepts enough recharge water to balance the pumping. The size and shape of the cone and the rate at which the water level is lowered are largely controlled by two factors—(1) the ability of the porous material that comprises the reservoir to transmit water, and (2) the thickness and storage properties of the reservoir. This fact suggests that the detailed character of the reservoir can be determined by observing the effect that pumping a well has on the water level in the reservoir.

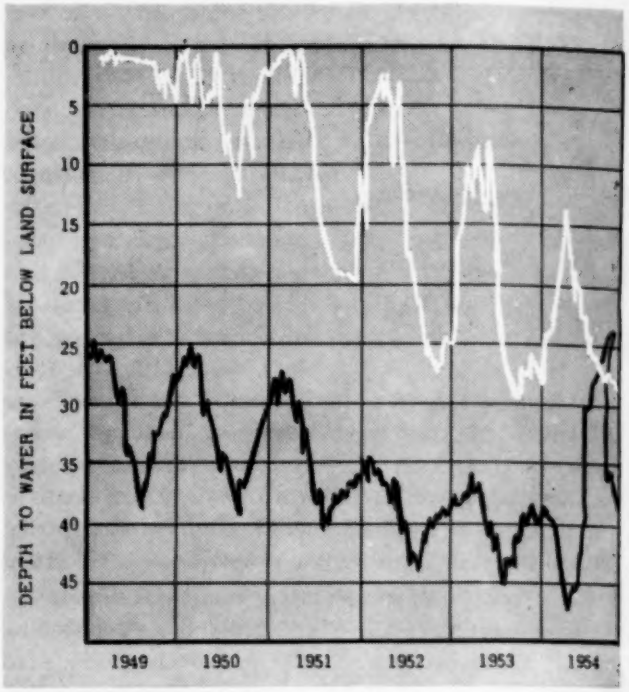
Controlled pumping tests (illustrated on this page)



may be made under a wide variety of conditions. The most useful method employs one pumped well together with several observation wells located around at various distances. When this type of study is used, the one well is pumped at a constant rate, or in steps, during each of which the rate is held steady. The magnitude of the drawdown produced by the pumping is measured in the observation wells at frequent intervals. Because the water level in a reservoir will change in response to any pumping, and also to some extent to changes of levels in adjacent streams, extraneous influences must be either controlled, removed, or measured if the data obtained from a pumping test is to be a true evaluation of the reservoir's potential.

Such data—properly analyzed—coupled with relevant geologic facts, will provide an accurate estimate of the nature of the underground reservoir. Its physical extent and the location of its boundaries can be learned. The volume of storage available can be measured. The amount of interference between wells can be calculated so as to provide a basis for planning the most efficient well spacing. The ultimate potential yield and the most efficient pumping rates can also be determined. Where speed is not a factor in the study of the hydrologic nature of an underground reservoir, much can be learned from a long-term systematic record of water-level changes in one or more otherwise unused wells.

In general, studies of these types make it possible to reach a number of conclusions. Whenever the discharge from a water-bearing formation is greater than its recharge, water levels decline. Thus, the long-term sustained yield of wells in any one area is limited to the average recharge received. Depending on the amount of storage space available in the formation, water can be withdrawn from storage in quantities exceeding the recharge, provided that the water is replaced during a later period when the recharge exceeds the withdrawal and before the water in storage is exhausted. Records of water levels in observation wells indicate the degree to which the reservoir is being depleted or replenished together with the volume of water in storage in the reservoir.



Records of underground water levels are important in determining the adequacy of the supply in relation to pumpage. The gradually declining water levels shown by the white line demonstrate pumpage exceeding the supply. The black line illustrates the situation where increasing pumpage does not exceed the normal recharge. The rapid recharge following the 1951-53 drought shows that the reservoir is still adequate to supply the demand during an extended drought period.

Surface Water Sources

Water flowing in rivers and into lakes, perhaps because it is visible, lacks the mystery and fascination of water percolating along under ground. But how large a supply can be sustained from a stream may be as little known as the potential yield from an underground formation.

Probably the most common misconception of stream flow is that the yield of any stream is more or less fixed, definite, and easily determinable. Many believe that only a few measurements are needed to answer any question or solve any problem concerning a particular stream. Nothing could be further from the truth.

Not only do the hydrographs differ, but also the maximum, minimum, and average flows from year to year. Nor are these differences necessarily of a minor character. It is not unusual for the maximum flow for one year to be many times greater than the maximum flow for the preceeding year or for many years. In 1936 the Ohio Valley suffered a severe drought, and that year the maximum flow of the Ohio River was among the lowest ever recorded. In January, 1937, the Ohio River Valley experienced one of the greatest flood disasters of its recorded history.

In the very recent past, southwestern United States suffered one of its severest droughts, which was finally broken by heavy, continuous rainfall that brought disastrous floods. About that time, a toastmaster at a banquet introduced a speaker from Texas as "... a man who had to row a boat to the courthouse to pick up his drought relief check". Though told in fun, the story is an apt reflection on the vagaries of rivers.

In view of the unpredictability of stream flow, experience would seem to be the best basis for the con-

trol and development of surface water. Experience is indeed a great help, but water-resource research has an important place too. Streams flow in response to certain definite natural laws. And since these laws have been defined, they can be used to determine the nature of a stream and help predict its flow pattern.

Each water course, whether a brooklet or the Missouri River, drains its own watershed. A watershed "system" includes all of the area drained by a stream and its tributaries. The systems are separated by divides which follow the highest land and which, like the peak of a roof, steer the water down one side or the other, into one watershed system or another. At the same time, tributary watersheds may combine into one watershed large enough to drain most of a continent. Such is the watershed of the Mississippi River.

The boundaries of a watershed set a finite limit within which water is controlled, but, of course, they do not determine the amount of water available. They only establish a catchment area for precipitation. The amount of water available at any time is determined by the precipitation. But inasmuch as its boundaries define an area of source of supply, the watershed provides the natural unit for studying and developing surface water supplies from streams. It also provides a basis for measuring and analyzing the stream flow.

Evaluating Water-Supply Sources

Water-resource research, as applied to rivers and streams, consists in part of statistically analyzing the day-to-day, week-to-week, and year-to-year measurements of stream flow. The data for analysis are obtained at key measuring stations throughout the nation maintained and operated by the United States Geological Survey and state agencies. These measurements are the "traffic counts" from which estimates and predictions of flow can be made. The accuracy of the estimates increases as the length of the record increases. Unfortunately, lengths of records vary greatly, and records are nonexistent for many streams.

Where the flow from a watershed has not been measured or where records go back only a few years, generally there are flow measurements from comparable near-by watersheds or from the larger stream fed by the smaller watershed which may supply data. These data, coupled with a study of local weather records, the physical character of the watershed, and a few selected samplings of the flow keyed to the control-measuring station, will provide the bases for computing what has been termed a "synthetic record of flow" at the ungaged point. Once these relationships have been established, all the estimates and predictions that can be made for the gaged stream can be made for the ungaged stream.

With the exception of flood prevention, most water-supply or control projects are keyed to the low flow of a stream. When the demand for water at a point on a river exceeds its minimum flow, the low flow must be increased or the demands cannot be met. The low flow can be increased by storing water either in on-stream or off-stream reservoirs from the surplus existing during high-flow periods. This excess can be used during low-flow periods. Properly and economically designed reservoirs store only enough water to provide the required quantity when added to the existing low flow. Stream-flow records, whether actually measured or synthetically developed, form the basis for estimating both the critical low flow and the volume of reservoir capacity required to increase the flow to the desired quantity. The records detailing the pattern of flow of a stream also provide the basis for estimating the ultimate sustained volume of water that may be developed from a given watershed.

In some cases, a reservoir designed to meet the most critical drought conditions may be quite costly in relation to the over-all need. In such cases, statistical and mathematical analysis of the flow data can provide an estimate of the frequency, severity, and duration of the most critical low flows. This, in turn, can be used as a basis for deciding whether it would be more feasible to store water for the exteme droughts or to restrict water use during what may be quite rare periods of such critical conditions.

One other facet of water-resource study as applied to surface water sources, which does not directly make use of stream-flow data, is worth mentioning. Where reservoirs are necessary to level out the pattern of flow, the watershed must be studied to locate the best sites.

Applying Water-Resource Knowledge to Planning

The foregoing has been largely devoted to a description of the techniques for determining the physical aspects of the water resource and may appear to be directed only toward new projects or new developments. However, the knowledge also has an important application to existing developments. The dependability and quality characteristics of the water supply available to many industrial plants were not known when the plants were built. To some extent this is also true of municipal and irrigation supplies. Without careful study who is to say, for example, whether a declining well yield is the result of overpumpage, too closely spaced wells, interference from another well field, a lowered well efficiency due to clogging of the

well screen or a near-by water-bearing formation, or the temporary effect of a drought period.

Even where communities currently have more than adequate water supplies, water-resource research has important implications for long-range planning to assure the continuing adequacy of the supply. Water shortages are most generally the result of an increased demand and an unforeseen drought. When a crisis strikes, there is little, if any, time for detailed study. Consequently, a temporary, often inadequate or even incorrect solution is likely to result. Careful analysis of the local physical nature of the water resource, coupled with projected needs, can point out places or circumstances where trouble may appear. It can also help in advance planning to avoid shortages and other supply problems.

In addition to determining the adequacy and ultimate potential supply of water, resource investigations have important applications to all aspects of water use, control, and development. Because water is a community or regional natural resource and a moving resource, a water project designed for one purpose can seldom be completed without sooner or later affecting some other use or purpose. As a result, conflicts will probably occur sooner or later. These are more likely to concern purpose or use, rather than legal, problems.

With respect to surface water in particular, these conflicts may be numerous and varied in nature. Although it is true that occasionally two uses may be found that, on the surface, appear to operate in harmony, the harmony will usually be found to be more apparent than real. As an illustration, the storage of flood waters in reservoirs to supplement the low flows for power development, irrigation, water supply, or other purposes appears to be in perfect accord with flood prevention. More careful consideration, however, shows that storage and flood control are conflicting. Storage demands that the reservoir be kept filled as much of the time as possible so that the water will be available when needed. For flood prevention, the reservoir should be emptied as quickly as practicable so that its capacity for storage will be available when the next flood arrives. In some cases reservoirs can be multipurpose, but only if they are designed as such with a complete knowledge of what is required.

Conflicts also occur in the uses to which a stream will be put. In some instances, the use of a stream for disposal of waste may appear to be perfectly valid but it will be valid only if it does not destroy the resource for some other use downstream. Conflicts develop with respect to the use of land for the storage of water versus agricultural or urban land use. Irrigation, because it is largely a consumptive use, may substantially reduce the volume available for other uses downstream.

These are only a few of the regional conflicts and problems that may result from a water-control project. There are many more aspects of regional water management including navigation, drainage, and recreation. Water-resource research as applied to an inventory of the nature of the water resource in an entire watershed can provide the knowledge that is essential to the careful planning needed to minimize conflicts.

In a sense it is physically possible to solve any water problem. It is physically possible, that is, if the cost of the solution can be met. Thus there are really two parts to all water problems, the physical and the economic. The two must balance and inasmuch as the one side of a balance sheet, the financial side, can be fairly accurately documented, it is essential that an equal documentation be made for the physical side of the balanced sheet. An understanding of water resources can make that documentation possible.

Conclusion

There are many other facets to problems of the use, control and development of water which have not been considered here. The solving of these problems calls for the application of diverse disciplines. For example, chemistry and chemical engineering have vital functions with respect to both the treatment of the water to render it usable for specific purposes and to eliminate pollution resulting from waste generation. Obviously the skills and techniques of the civil and sanitary engineer are essential to design and construct the necessary facilities. An intimate knowledge of the many and varied industrial processes can be extremely valuable wherever in-plant conservation, through recycling, reuse, and multiple use, becomes a factor. Area and industrial economists can contribute much to area or regional considerations by measuring the economic importance of water to the area as well as by providing data for projecting demand. Other sciences and combinations of sciences are vital to additional basic research into problems such as developing an economical method of converting saline to fresh water.

In the last analysis, the study of water resources is concerned with effective water conservation. Water's energy must be harnessed, its destructiveness tamed, and its irregularities modified. It must be more dependable in supply, and its quality must be safeguarded to the greatest extent practicable. These are the goals of water conservation. Their achievement will require an intimate knowledge of water in all its aspects. Modern science and technology applied to research on water problems can provide much of the necessary knowledge.

NOTES from BATTELLE

COTTON TREATMENT STUDY

By treating cotton with different chemicals, scientists have made available cotton fabrics with a variety of properties. Recent experiments have indicated that desirable wash and wear properties are imparted to cotton fabrics treated with ethylene ureas and ethylene amides. These compounds alter some properties of cotton by forming polymers in and on the fibers. It is anticipated that thorough exploration of the effects of the compounds upon cotton may reveal other desirable properties.

Battelle technologists are now studying the various effects of ethylene urea and ethylene amide compounds upon cottons. Their research studies are sponsored by the U. S. Department of Agriculture. They are part of a comprehensive program of research aimed at improving processing methods and utilization properties of cotton centered in the Southern Utilization Research and Development Division of the Agricultural Research Service, New Orleans, Louisiana, which is headquarters for USDA cotton utilization research. The Southern Division negotiated the research contract with Battelle for the USDA. Leon Chance, of the Cotton Chemical Laboratory, is supervising the study for USDA, Dr. Robert I. Leininger for Battelle.

CUTTING-FLUID RESEARCH

Cutting fluids are generally thought of as liquids that are applied close to the cutting site to improve machining operations on metals. However, a broader definition that includes gases and air as cutting fluids is also sometimes used. The latter definition was adopted by Battelle technologists Stanley L. Cosgrove and Roy W. Greenlee in their presentation on "Present Knowledge of Cutting-Fluids" before the Annual Meeting of the American Society of Tool Engineers in Philadelphia recently.

In their paper, the authors evaluated the role of cutting fluids, including gases, in some of the simpler cutting operations. They also examined the basic principles and experimental support for several theories that have been advanced to explain the mechanisms of cutting-fluid action. They have found that even simple metal-cutting operations involve complex physical and chemical changes which are not as yet fully understood. For this reason, many mechanisms may co-exist, and the basic problem is one of determining the relative importance of each mechanism for a given combination of metal-machining conditions.

The authors stated that since techniques for truly analytical studies of the effect of cutting speed upon both temperature and tool life simultaneously are now available, research must be directed to full investigation of speed-wear-temperature relationships for different workpiece materials and cutting fluids.

They specifically recommended research: to prove or disprove current theories on the mechanism of cutting fluid action; on the effect of widely varying rates of cutting fluid application; and to determine the extent of chemical reactions between chips, tools, and fluids as well as the degree and rate of penetration of fluids into the cutting zone.

RARE-EARTH RESEARCH

The rare earths are well known for their use in such diverse products as cigarette lighter flints, sun glasses, and vacuum tubes. They are also used frequently in metal alloys and in ceramic materials.

These elements were called rare earths by pioneering 18th century scientists because of the extreme difficulty of separating and classifying them one from another. However, large new deposits and improved methods of separation, developed in the past decade, have greatly increased the supply of rare earths for commercial purposes.

The problem of finding new uses for the rare earths is being attacked at Battelle through research jointly sponsored by seven of the nation's principal producers of those materials.

In the two-year study, which began recently at the Institute, scientists will seek new uses for individual elements in the rare-earth category, as well as new uses involving combinations of these elements. The 15 rare earths include elements numbered 57 through 71 on the Periodic Table. The group contains such elements as lanthanum, cerium, and europium.

The rare-earth producers sponsoring the research program include: Davison Chemical Company, Division of W. R. Grace & Co.; Electro Metallurgical Company; Heavy Minerals Company; Lindsay Chemical Company; Mallinckrodt Chemical Works; Michigan Chemical Corporation; and Molybdenum Corporation of America.

"If the name 'rare earths' fairly described these elements," says Richard J. Anderson of Battelle, "it would be pointless for us to search for new uses for them. Actually, the rare earths are *not* rare. For example, there is more cerium, one of the rare earths, in the earth's crust than there is antimony, tungsten, or mercury, to mention only a few. There is a tremendous potential supply of the rare earths." Anderson, a geologist and a member of the Institute's administrative staff, will provide liaison in the project between Battelle and the sponsoring firms.

The problem of finding new uses for the rare earths will be attacked by three different Battelle research teams under the direction of Dr. John Foster. Dr. Horatio H. Krause, Jr., heads up the team of chemists; James F. Miller, the physicists; and Dr. George W. P. Rengstorff, the metallurgists.

ULTRASONIC WELDING

The possibility of using ultrasonic energy for welding metals was discovered less than ten years ago. Today, the technique is being applied in a limited way to commercial welding. Welding technologists know some of the things ultrasonic energy will do. They are seeking to learn more about the mechanisms involved and the capabilities of this type of welding.

As a step in this direction, Wright Air Development Center is sponsoring a dual-purpose study at Battelle. The research is planned to determine the value of ultrasonic welding as a technique for both spot and seam welding of high-temperature alloys used in modern aircraft. At the same time, Battelle scientists will seek a better fundamental understanding of how ultrasonic or vibratory energy causes metal to be joined. "This is a good example of a research study that is both basic and applied", points out John N. Antonevich. He, along with Norman E. Weare, Robert E. Monroe, and David C. Martin, is a key member of the Battelle team conducting the research. The 12-month study is now at its midpoint.

The device used at Battelle for experimental ultrasonic welding employs a transducer composed of laminated nickel sheets wound with a coil. When alternating current is passed through the coil, magnetostriction causes the nickel to expand and contract rapidly, thus creating a vibration. The motion produced is transferred to an acoustical velocity transformer or "horn" and is concentrated at the point of the horn which serves as a welding tool. Thin metal strips are welded by laying one on top of the other and pressing them against the horn. With low clamping pressures, it is possible to effect a strong weld between the strips of metal in a matter of seconds.

Just what causes the strips to be welded together is one of the important questions for which the Battelle team seeks an answer. "It may be due to diffusion, recrystallization, mechanical interlocking, or fusion," says Antonevich, "and in all probability, all mechanisms play a part in producing ultrasonic welds."

At least several potential advantages in ultrasonic welding have already been recognized by the Air Force. Since little pressure is required to effect the weld, deformation of the metal is kept at a minimum. Moreover, the heat generated when the weld is made is localized and is quickly dissipated, making ultrasonic welding a cool process. A cool welding technique will be particularly valuable when joining metals such as molybdenum or niobium, and in making dissimilar metal welds. Welds in these materials show poor properties when extreme heat is applied to them during the welding operation.

MINERALS IN NUTRITION

The rapid expansion of research in the relationship of trace elements to the nutrition of plants and animals has resulted in a voluminous literature. As a continuation of an earlier publication on the subject, Frank A. Gilbert, of Battelle, has prepared a survey which covers recent research. The new volume, *Mineral Nutrition and the Balance of Life*, has been published by the University of Oklahoma Press.

The survey covers each of 22 known essential mineral elements. In addition to phosphorus, potassium, and calcium, Gilbert discusses those that are less well known, including vanadium, silicon, selenium, arsenic, and lead. The author presents the research history, soil relationships, value to plants and animals, deficiency symptoms, and geographical regions of deficiency of each element. He also discusses enzymes, hormones, and vitamins associated with nutrition as well as pertinent analytical methods. One chapter is devoted to the relationship of soils and fertilizers to our national health.

Writings by STAFF Members

Machinability Can Be Related to Composition. F. W. Boulger and H. J. Grover. *Tool Engineer*, v. 40, March 1958, pp. 114-115.

SAE ratings were used in a multiple correlation analysis to learn the apparent effects of variations in chemical analysis. A definite relation between composition and machinability was observed.

Graft Polymerization on Polyethylene. H. George Hammon. *SPE Journal*, v. 14, March 1958, pp. 40-42.

Graft copolymerization is a means of tailor-making a polymeric molecule in order to build in desired properties. The use of soft X-rays in graft copolymerization permits the economical treatment of thin sections, or of altering mainly the surface of thicker sections. Studies in which acrylonitrile, vinyl acetate, and vinyl pyrrolidone were grafted to polyethylene film are summarized.

Maleic Modification of Acid-Refined Tall Oil Varnishes. E. E. McSweeney, R. K. Brandt, and E. R. Mueller. *Industrial and Engineering Chemistry*, v. 50, March 1958, pp. 327-328.

Formation of minor amounts of insoluble material during cooking of maleic-modified tall oil esters can be prevented by preesterification of tall oil with polyol before maleic addition, or reaction of maleic and tall oil at 450 F. The latter method is preferred because it is somewhat faster. Formation of insolubles is not directly related to tall oil abietic acid content.

Survey Hot-Work Tool Steels for Aircraft and Missiles. I. R. J. Nekervis, C. H. Lund, and A. M. Hall. *Iron Age*, v. 181, February 27, 1958, pp. 99-102.

In many respects, hot-work tool steels show great promise for the aircraft and missile applications of the future. The properties and fabricating characteristics of several steels are reported. Medium-carbon, Ni-free alloys appear to be most suitable.

Survey Hot-Work Tool Steels for Aircraft and Missiles. II. R. J. Nekervis, C. H. Lund, and A. M. Hall. *Iron Age*, v. 181, March 6, 1958, pp. 120-121.

A rundown of the actual experience of users in the production, welding, and machining of hot-work tool steels.

Coal Research in 1957. Harlan W. Nelson and Richard B. Engdahl. *Mining Congress Journal*, v. 44, February 1958, p. 110 + 5 pages.

A review of world-wide activities directed toward developing better and more economical ways to mine, prepare, and use coal.

Antimony Plating on Steel and Zinc. G. R. Schaer, W. H. Safranek, and C. L. Faust. *Plating*, v. 45, February 1958, pp. 139-143.

A method was developed for plating Sb more adherently on steel by pretreating the steel anodically in phosphoric and other acid solutions. Antimony-plated steel was superior to zinc-plated steel in resisting corrosion in salt spray fog and in air saturated with water vapor. No bulky corrosion products were formed on the Sb plate. Very thin Sb immersion coatings on Zn were effective against corrosion.

Members of the Battelle staff are authors of the recently published articles and books listed on these pages. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

Compilation of Chemical Compositions and Rupture Strengths of Super-Strength Alloys. Ward F. Simmons and V. N. Krivobok, compilers. 6 pp. American Society for Testing Materials, Philadelphia, Pennsylvania.

This compilation lists the name, nominal chemical composition, characteristic rupture strengths for rupture in 100 and 1000 hr., and patentee for approximately 150 domestic and 75 foreign alloys. It includes the ferritic (martensitic) alloys and age-hardening stainless steels, but not the conventional austenitic stainless steels.

Trends and Outlook for Technological Progress From the Standpoint of the Research Scientist. B. D. Thomas. *ASTM Bulletin*, February 1958, no. 228, p. 70.

The military and economic strength of the U. S. will depend primarily on actions of the Federal Government that encourage scientific and technological progress and industrial enterprise. There is a pressing need for more public appreciation of the role of science and technology in our economy. This must be built up through education and sympathetic support of all elements in our society.

Creep of Aluminum-Copper Alloys During Age Hardening. E. E. Underwood, L. L. Marsh, and G. K. Manning. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4036, February 1958, 73 pp.

The interrelation of aging during creep and of creep during aging was studied in polycrystalline aluminum alloys containing 1 to 4 per cent copper. Aging of 2-per cent-copper alloys under stress resulted in two to three times more precipitation than there was in unstressed samples. The maximum measured amount of precipitation was about 10 times greater than that indicated by the phase diagram, assuming the equilibrium precipitate. The compositional dependence of the minimum creep rate at constant temperature revealed a marked increase in creep strength at compositions just inside the two-phase boundary.

Inert-Gas-Shielded Consumable-Electrode Welding of Molybdenum. N. E. Weare, R. E. Monroe, and D. C. Martin. *Welding Journal*, v. 37, March 1958, pp. 117-s - 124-s.

Studies of arc stability and metal transfer in molybdenum arcs, and the immediate problems in adapting the inert-gas-shielded consumable-electrode process for molybdenum welding, are discussed.

The Electrical Properties of Uranium Oxides. Robert K. Willardson, Jerry W. Moody, and Harvey L. Goering. *Journal of Inorganic and Nuclear Chemistry*, v. 6, no. 1, February 1958, pp. 19-33.

The electrical conductivity and thermoelectric power of uranium oxides in the UO_2—U_3O_7 range was studied at temperatures between 27 and 400 C after annealing at various elevated temperatures. The following compounds were identified: UO_{2+x}, a metal-deficit semiconductor; U_3O_{8-y}, a metal-excess semiconductor; and U_3O_{7-z}, a metal-excess semiconductor. The presence of all major phases was confirmed by X-ray powder techniques.

Engineering Materials Handbook, 1958. McGraw-Hill Book Company, Inc., New York, contains the following articles by staff members:

Thorium. John R. Keeler, pp. 42-48.

Data on thorium as an engineering material is given with reference to reduction, melting and fabrication, properties, joining, machining, corrosion, alloys, and health hazards.

Electroplated Coatings and Allied Processes. William H. Safranek, Leslie D. McGraw, Luther E. Vaaler, John G. Beach, and Paul T. Woodberry, pp. 1-45.

This thorough compilation of engineering data deals with applications, specifications, tests, properties of electroplates, preparation for plating, equipment and control, economics of electroplates, and other related coatings, cleaning, and polishing methods.

WORLD-WIDE ABSTRACTS

in the FIELDS of

309a Aeronautical Engineering
310a Agriculture
311a Biochemistry and Biophysics
316a Ceramics and Concrete
319a Chemical Engineering
320a Chemistry—Analytical
323a Chemistry—Inorganic and General
324a Chemistry—Organic
330a Chemistry—Physical
335a Coatings
336a Control Systems, Computers, and Systems Engineering
338a Electrical Engineering
339a Electrochemistry
340a Electronics
344a Engineering Economics
344a Fluid Mechanics
345a Food Technology
346a Fuels and Combustion
347a Geology, Geophysics, Mineralogy, and Mining Engineering
349a Graphic Arts
350a Heat Power
350a Information—Preparation and Dissemination
351a Instrumentation
352a Lubrication and Friction
353a Mechanical Engineering
354a Metallurgy
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BATTELLE Technical Review ABSTRACTS

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***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

6182 Some Effects of Kinetic Heating on the Stiffness of Thin Wings. II. Analysis of Flexural and Torsional Stiffnesses for Large Deformations of Thin Solid Wings. S. L. Kochanski and J. H. Argyris. *Aircraft Engineering*, v. 30, Feb. 1958, p. 32-40.

Effects of large spanwise curvature and rate of twist on distortion of the cross-section when thermal stresses are present. (To be continued.)

6183 Measurements of the Total Absorptivity for Solar Radiation of Several Engineering Materials. Richard C. Birkebak and J. P. Hartnett. *ASME, Transactions*, v. 80, Feb. 1958, p. 373-378.

Values are given for several porous materials presently being considered for transpiration cooling of high-speed vehicles.

6184 Some Methods for the Structural Design of Wings for Application Either at Ambient or Elevated Temperatures. J. W. Semonian and R. F. Crawford. *ASME, Transactions*, v. 80, Feb. 1958, p. 419-426.

6185* (German.) Properties of Hydrogen and Water as the Working Media for Rocket Propulsion Unit Heated With Nuclear Energy. **Die Eigenschaften von Wasserstoff und Wasser als Arbeitsgase für kernenergetisch beheizte Raketentriebwerk.** Irene Sänger-Bredt. *Astronautica Acta*, v. 3, no. 4, 1957, p. 241-280.

6186 How to Estimate Solid Propellant Rocket Performance. Saxe Dobrin. *Aviation Age*, v. 28, Feb. 1958, p. 70-73.

6187* Aerophysical Problems of Flight at Extreme Altitudes and Speeds. II. Hypersonic Effects. *Canadian Aeronautical Journal*, v. 4, Feb. 1958, p. 39-47.

Characteristics of hypersonic flow; physical properties of air at high temperature; relaxation effects; the shock wave in hypersonic flow; hypersonic expansion flows; aerodynamic heating. (To be continued.)

6188* Stability and Control Characteristics of the Vertical Attitude Vtol Aircraft. E. R. Hinz. *Canadian Aeronautical Journal*, v. 4, Feb. 1958, p. 52-62.

6189* (French.) Preservation of the Ideal Attack in Tapered Wings by Means of a Leading Edge Flap. **Sur le maintien de l'attaque idéale, par volet de bord d'attaque, pour des ailes en flèche effilées.** Maurice Fenain. *Comptes Rendus*, v. 245, no. 25, Dec. 16, 1957, p. 2192-2194.

The problem of maintaining the ideal angle of attack when the Mach number and the incidence vary was solved by using a leading edge flap for which the law of deflection was known in advance.

6190* (French.) Numerical Determination of Transitory Temperatures in Wings. **La détermination numérique des témperatures transitoires dans les ailes.** G. Lehr. *DOCAERO; Revue Documentaire de la Technique Aéronautique Mondiale*, 1958, no. 48, Jan., p. 3-14.

Special heat transfer cases. Equations are derived by means of finite differences of thermal unidimensional unsteady flow. Numerical applications under different temperature conditions.

6191* (French.) Influence of the Gyroscopic Effects of a Turbojet on an Airplane During Vertical Take-Off. **Influence des effets gyroscopiques d'un turboréacteur sur un avion décollant a la verticale.** G. Ernst and J. Jardinier. *DOCAERO; Revue Documentaire de la Technique Aéronautique Mondiale*, 1958, no. 48, Jan., p. 19-28.

In connection with the steering difficulties during vertical takeoff, a theoretical study was made of the possibility to compensate for the effects of gyroscopic phenomena and delay in the application of steering motions.

6192 History of German Guided Missiles Development. Th. Benecke and A. W. Quick, editors. 420 p. 1957. Verlag E. Appelhans & Co., Brunswick, Germany. (UG630 N81.1h)

6193 Communications and Navigation Techniques of Interplanetary Travel. Peter A. Castruccio. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-4- Dec. 1957, p. 216-223. (TK1 In6.6a Vis.)

Sufficient advances by 1975 are foreseen to insure omnidirectional coverage within the orbit of Jupiter.

6194 Effect of Air Drag on Elliptic Satellite Orbits. Robert E. Roberson. *Jet Propulsion*, v. 28, Feb. 1958, p. 90-96.

Variation of parameters and the Krylov-Bogoliuboff approximation method are used to find simple approximate expressions for the decay of radius with true anomaly, and the growth of true anomaly with time.

6195 An Experimental Investigation of the the Flow Over Simple Two-Dimensional and Axial Symmetric Bodies at Hypersonic Speeds. I. E. Vas, S. M. Bogdonoff, and A. G. Hammitt. *Jet Propulsion*, v. 28, Feb. 1958, p. 97-104.

6196 The Effects of Afterbody Length and Mach Number on the Normal Force and Center of Pressure of Conical and Ogival Nose Bodies. William E. Buford. *Journal of the Aeronautical Sciences*, v. 25, Feb. 1958, p. 103-108.

6197 Effect of Dissolution on Oleopneumatic Shock-Strut Performance. Charles W. Bert. *Journal of the Aeronautical Sciences*, v. 25, Feb. 1958, p. 135-136.

Experimental data on pneumatic load-stroke performance in the case of static and slowly applied loading, such as found in gentle landings and taxiing, follow closely as theoretical curve determined while taking into account the effect of air dissolution in the oil. This curve differs significantly from that determined by simple air-compression theory. The latter remains valid for rapid loading because of the time lag between compression and dissolution.

6198 Optimization of Rocket Orbits. I. Idealized Calculations. Kenneth W. Ford. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2166, Feb. 1958, 33 p. (UF767 U3La Contin.)

Thrust programs for several kinds of rocket orbit optimization are derived and discussed in the idealized flat earth approximation. Quantities made extremal (one at a time) are rocket velocity, rocket altitude, rocket energy (all at burnout), mass ratio, and range.

6199 The Plasma Jet: Research at 25,000°F. J. W. Reid. *Machine Design*, v. 30, Feb. 6, 1958, p. 22-24.

A roaring blast of gas and ionized water, at temperatures over twice those at the sun's surface, is one of the newest research tools for probing the thermodynamics of missile and rocket flight.

6200 The Blow-Down Wind Tunnel at Aachen. A. Naumann, A. Heyser, and W. Trommsdorff. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development* Report 69, Aug. 1956, 22 p. (TL565 Ag11r Vis.)

Construction, operation, and aerodynamic performance.

6201 A Contact Extensometer for the Recording of Flight-Load Spectra. O. Svenson. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 121, May 1957, 12 p. (TL565 Ag11r Vis.)

The varying stress cycles are registered on a film which is run at low speed, and the subsequent analysis can be made by any method desired.

6202 A Flight Technique for the Measurement of Thrust Boundaries and of Drag Due to Lift. H. D. Rylands. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 123, May 1957, 16 p. (TL565 Ag11r Vis.)

6203 NACA Hypersonic Rocket and High-Temperature Jet Facilities. Paul E. Purser and Aleck C. Bond. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 140, July 1957, 15 p. (TL565 Ag11r Vis.)

Discusses the extension of the rocket-model research of the NACA to hypersonic speeds and describes briefly several high-temperature jet facilities assembled for research on structures and materials.

6204 The Effects of Kinetic Heating on Aircraft Structures. A. W. Kitchenside. *Royal Aeronautical Society, Journal*, v. 62, Feb. 1958, p. 105-117.

Fundamental aspects of the problem of kinetic heating and some methods of its alleviation. Discussion is limited to metallic materials and a maximum temperature of 500 C.

6205 The Pressure Jet Helicopter. A. Stepan. *Royal Aeronautical Society, Journal*, v. 62, Feb. 1958, p. 123-131.

General review with detailed treatment of some of the special problems. The ram-jet and the tip-jet rotor system are discussed.

6206 Correlation, Evaluation, and Extension of Linearized Theories for Tire Motion and Wheel Shimmy. Robert F. Smiley. *U. S. National Advisory Committee for Aeronautics, Report* 1299, 1957, 48 p. (TL521 Un3r Vis.)

6207 On Panel Flutter and Divergence of Infinitely Long Unstiffened and Ring-Stiffened Thin-Walled Circular Cylinders. Robert W. Leonard and John M. Hedgepeth. *U. S. National Advisory Committee for Aeronautics, Report* 1302, 1957, 19 p. (TL521 Un3r Vis.)

6208 Summary of Flutter Experiences as a Guide to the Preliminary Design of Lifting Surfaces on Missiles. Dennis J. Martin. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4197, Feb. 1958, 21 p. (TL570 Un3t)

Several types of flutter of concern in missile studies are described. Crude criteria are presented for two of the most common types of flutter to permit a rapid estimate of the probability of the occurrence of flutter.

6209 Experimental Thermal Conductivities of the $N_2O_4 \rightleftarrows 2NO_2$ System. Kenneth P. Coffin and Cleveland O'Neal, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4209, Feb. 1958, 22 p. (TL570 Un3t)

Thermal conductivity was measured by a hot-wire technique at temperatures between 20 and 215 C and pressures from ¼ to 1 atm; approximate values were obtained at pressures as low as 0.02 atm from 20 to 80 C.

6210 The Design, Instrumentation and Operation of the UTIA Low Density Wind Tunnel. K. R. Enkenhus. *University of Toronto, Institute of Aerophysics, UTIA Report No.* 44, June 1957, 175 p. (TL570 T64.84a Vis.)

Data on a continuous, open circuit tunnel with vacuum pump drive designed to operate at Mach numbers up to 5 at pressures suitable for the study of rarefied gas flows.

6211* (German.) The Non-Steady Supersonic Flow Through Cascades With Reaction. **Über die instationäre Überschallströmung durch Schaufelgitter mit Rückwirkung.** I. Ryhming. *Zeitschrift für Angewandte Mathematik und Mechanik*, v. 37, nos. 11-12, Nov.-Dec. 1957, p. 416-431.

If the relative velocity between rotor and guide vanes is taken into account, non-steady phenomena emerge which may be classified as quasi-steady and non-steady respectively. The quasi-steady phenomena, which are the more important ones from a practical point of view, may be treated in much the same way as the steady ones.

See also: **6742** (wind-tunnel drive); **6747** (automatic ground instrumentation for guided missiles); **6857** (airborne Doppler velocity measurement); **6870** (guided missile telemetry).

AGRICULTURE

6212 Annual Review of Entomology. Edward A. Steinhaus and Ray F. Smith, editors. v. III. 520 p. 1958. Annual Reviews, Inc., Palo Alto, Calif. (QL461 An78 Vis.)

These 23 articles review the literature on subjects such as pest control, nutritional requirements of insects, and miscellaneous physiological or morphological phenomena.

6213 Atomic Energy and Agriculture. C. L. Comar, editor. 450 p. 1957. American Association for the Advancement of Science, Washington, D. C. (QH324 Am35a)

Contents include chapters on soil-plant relations, plant and animal metabolism, crop improvement, agricultural entomology, and food sterilization.

6214* (Italian.) Behavior of Some Complex Granular Fertilizers in the Ground. Solubility of the Fertilizing Elements. **Comportamento di alcuni concimi granulari complessi nel terreno. Solubilità degli elementi fertilizzanti.** Paolo Fontana. *Bollettino Scientifico della Facolta' di Chimica Industriale di Bologna*, v. 15, no. 4, 1957, p. 103-105.

Behavior of fertilizers containing P and NH_3 or N, P, and K, in soils washed by rains. Nitrogen of binary fertilizer was completely washed away contrary to the behavior of ternary fertilizers.

6215* Recent Trials With New Acaricides in British Columbia Orchards. R. S. Downing. *Canadian Journal of Plant Science*, v. 38, Jan. 1958, p. 61-66.

6216 Bamboo: The Facts and the Problem. R. H. Stevens. *Chemurgic Digest*, v. 17, Jan. 1958, p. 8-12.

A presentation of the available facts concerning bamboo and its potential as a major new crop in Southern U. S.

6217 A Critical Review of the Techniques for Testing Insecticides. J. R. Busvine. 208 p. 1957. Commonwealth Institute of Entomology, London. (SB951 B96c)

A review. General principles; standardization; types of poison; toxicological statistics.

6218 Drainage of Agricultural Lands. James N. Luthin, editor. 620 p. 1957. American Society of Agronomy, Madison, Wisconsin. (S621 L97d)

The book comprises a series of papers on the various aspects of the removal of excess subsurface water.

6219 Review of Chemistry and Research Potential of *Simmondsia Chinensis* (Jojoba) Oil. Nestor B. Knoepfler and H. L. E. Vix. *Journal of Agricultural and Food Chemistry*, v. 6, Feb. 1958, p. 118-121.

Jojoba nuts contain 50% of an oil which is a liquid wax, similar in some respects to sperm whale oil. Current interest in this seed stems from the dependency of the U. S. on foreign sources of plant wax.

6220 Biotic Factors in Natural Control of Citrus Mealybugs in California. B. R. Bartlett. *Journal of Economic Entomology*, v. 50, Dec. 1957, p. 753-755.

Localized outbreaks are frequently associated with the destruction of natural enemies by DDT drift from adjoining areas. *Cryptolaemus montrouzieri* Muls. was found to be an effective predator at high host densities.

6221 Some Factors Influencing the Predation of *Polistes* Wasps on the Tobacco Hornworm. R. L. Rabb and F. R. Lawson. *Journal of Economic Entomology*, v. 50, Dec. 1957, p. 778-788.

Predictors, chiefly *Polistes*, killed 68% of the hornworm larvae but did not reduce the population below an economic level.

6222 Organic Phosphorus Insecticides as Residual Sprays for the Control of House Flies. J. B. Gahan, H. G. Wilson, J. C. Keller, and Carroll N. Smith. *Journal of Economic Entomology*, v. 50, Dec. 1957, p. 789-793.

Dow ET-15, Dow ET-57, Diazinon, Bayer 21/199, and EPN were found to be the most effective residual sprays against house flies.

6223 Evaluation of Synerigized Pyrethrins on Various Strains of House Flies. W. N. Bruce. *Journal of Economic Entomology*, v. 50, Dec. 1957, p. 828-829.

Sesoxane was the best single synergist tested at both 5 to 1 and 10 to 1 ratios with pyrethrins.

6224 A Field Strain of Malathion-Resistant House Flies. John W. Kilpatrick and H. F. Schoof. *Journal of Economic Entomology*, v. 51, Feb. 1958, p. 18-19.

Presents data on both physiologic and behavioristic resistance to malathion.

6225 Reproductive Potential and Longevity of Two Relatively Isolated Field Populations of Insecticide-Susceptible House Flies. Fred W. Knapp and Herbert Knutson. *Journal of Economic Entomology*, v. 51, Feb. 1958, p. 43-45.

Some variations in results of control measures may be explained by the work reported in this paper. It also emphasizes the innate differences between field populations so that correlation between biological variations and such characteristics as resistance need not necessarily be expected.

6226 Toxicity of Pesticides to Honey Bees in Laboratory and Field Tests in Southern California, 1955-1956. L. D. Anderson and E. L. Atkins, Jr. *Journal of Economic Entomology*, v. 51, Feb. 1958, p. 103-108.

Thirty-three compounds were compared for relative toxicity to honey bees.

6227 An Automation System for Insectaries. Irvin Levin, Heinz W. Kugler, and Herbert C. Barnett. *Journal of Economic Entomology*, v. 51, Feb. 1958, p. 109-111.

Discusses a variable 24-hr. program timer which permits the coordination of numerous pieces of equipment which govern or affect temperature, lighting, etc.

6228 Mineral Nutrition and the Balance of Life. Frank A. Gilbert. 350 p. 1957. University of Oklahoma Press, Norman, Oklahoma. (QK867 G37mn)

A comprehensive survey of the literature on mineral nutrition in plants and animals, with detailed treatment of the history, geographical distribution, control, and effects of individual elemental deficiencies.

6229 A Chromatographic Method for Studying Simple Compounds in Plants. R. N. Greenshields. *Nature*, v. 181, Jan. 25, 1958, p. 280-281.

The method is to press the sap juices of the plant in question directly on to the chromatogram.

6230* Research to Improve and Expand the Use of Southern Farm Products in Protective Coatings. C. H. Fisher and L. A. Goldblatt. *Official Digest, Federation of Paint and Varnish Production Clubs*, v. 30, Feb. 1958, p. 189-206.

6231* A Method for Isolating Virus-Like Particles From Woody Plants Showing Symptoms of Elm Phloem Necrosis, Peach X-Disease, and Cherry Ring Spot. H. H. Thornberry. *Phytopathology*, v. 48, Jan. 1958, p. 15-19.

A method was developed for isolating virus-like particles from foliage of woody plants with viral infections. It combined the principles of dilutive extraction, clarification of extract by filtration, concentration and partial purification by adsorption and elution, and differential sedimentation by ultra-centrifugation.

6232* The Downward Translocation of Antibiotics in Plants. Reed A. Gray. *Phytopathology*, v. 48, Feb. 1958, p. 71-78.

The antibiotics streptothricin and pleocidin, when sprayed on intermediate leaves of bean or tobacco plants at a concentration of 1%, were readily translocated in high amounts, downward to older leaves and upward to the young leaves.

6233* Qualitative Studies of Soil Microorganisms. XV. Capability of the Predominant Bacterial Flora for Synthesis of Various Growth Factors. A. G. Lochhead. *Soil Science*, v. 84, Nov. 1957, p. 395-403.

A study was made of the ability of 316 cultures to synthesize in various media five growth factors, namely thiamine, biotin, vitamin B_{12}, riboflavin, and the terregens factor.

6234* Kinetics of Phosphate Uptake in the Soil-Plant System. Maurice Fried, C. E. Hagen, J. F. Saiz Del Rio, and J. E. Leggett. *Soil Science*, v. 84, Dec. 1957, p. 427-437.

The rate of formation of soil solution phosphorus was compared with the rate at which phosphorus is absorbed by the plant from soil solution.

6235* Physico-Chemical Behavior of Clay-Conditioner Complexes. R. M. Holmes and S. J. Toth. *Soil Science*, v. 84, Dec. 1957, p. 479-487.

Problems encountered in the study of the reaction mechanisms involved in soil aggregate stabilization.

6236 The Use of Commercial Fertilizers—Particularly Nitrogen in Forestry. Hermann Mayer-Krapoll. 111 p. 1956. Allied Chemical & Dye Corp., New York. (S651 M45u)

See also: **6931** (colorimetric estimation of Malathion residues); **7038** (application of isotopes in agricultural research); **7701** (possible substitute fibers for papermaking).

BIOCHEMISTRY AND BIOPHYSICS

6237* (English.) **The Effect of Ions on the Catalytic Activity of Enzymes: The Old Yellow Enzyme.** William J. Rutter and Brita Rolander. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1663-1670.

Fe^{3+} ions can act as electron acceptors in the reaction, and with chelated iron compounds as the electron acceptor, the reaction rate increases markedly.

6238 Advances in Protein Chemistry. C. B. Anfinsen, Jr., M. L. Anson, Kenneth Bailey, and John T. Edsall, editors. v. XII. 687 p. 1957. Academic Press, New York. (QD431 Ad95 Vis.)

Papers on the fibrinogen-fibrin conversion, X-ray analysis of protein structure, properties and genetic control of human hemoglobins, melanocyte-stimulating and lactogenic hormones, activation of zymogens, chemistry of antibodies, and peptide synthesis.

6239 Synthesis of Potential Anticancer Agents. XIII. Ribosides of 6-Substituted Purines. James A. Johnson, Jr., H. Jeanette Thomas, and Howard J. Schaeffer. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 699-702.

The syntheses of six 6-substituted-9-β-D-ribofuranosylpurines from 6-chloro-9-β-D-ribofuranosylpurine have been accomplished.

6240 The Isolation and Characterization of Three Crystalline Antibiotics From *Streptomyces plicatus*. Theodore H. Haskell, et al. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 743-747.

One of these antibiotics is amicetin, while the other two, designated as plicacetin and bamicetin, are novel. The three entities can be readily differentiated from each other by paper chromatographic and solvent extraction procedures.

6241* Superior Adsorbent Properties Have Been Demonstrated for Activated Attapulgite. Martin Barr. *American Pharmaceutical Association, Journal (Practical Pharmacy Ed.)*, v. 19, Feb. 1958, p. 85-87.

Adsorptive studies on alkaloids, bacteria, and diphtheria toxin have revealed that activated attapulgite is superior to kaolin as an adsorptive agent.

6242* The Onion Test as a Possible Screening Method for Antitumor Agents. Carl Alfred Ammann and Robert S. Safferman. *Antibiotics & Chemotherapy*, v. 8, Jan. 1958, p. 1-7.

Four chemical substances with known antitumor activity, and 22 culture filtrates from actinomycetes and fungi, were tested for their antimitotic activity on *Allium cepa* root tips. Actinomycin D, azaserine, and a filtrate from a *Helminthosporium* sp. showed strong antimitotic effects and were also active against tumors in mice.

6243* Intermediary Metabolism of Antibiotic-Resistant and Antibiotic-Sensitive Staphylococci. II. Oxidation of Glucose Intermediates and Reversal of Resistance Under Anaerobiasis. Matthew H. Fusillo and Daniel L. Weiss. *Antibiotics & Chemotherapy*, v. 8, Jan. 1958, p. 21-26.

6244* Two Simple Methods for the Detection of Chemical Mutagens. V. N. Iyer and W. Szybalski. *Applied Microbiology*, v. 6, Jan. 1958, p. 23-29.

Two simple methods for detecting bacterial mutagens have been devised with the following application in mind: an efficient, large-scale survey of pure chemicals and natural complex substances for mutagenic activity to serve as a guide for the study of carcinogenicity, and in the search for effective antineoplastic agents.

6245* A Guide for the Classification of *Streptomycetes* According to Selected Groups. Placement of Strains in Morphological Sections. T. G. Pridham, C. W. Hesseltine, and R. G. Benedict. *Applied Microbiology*, v. 6, Jan. 1958, p. 52-79.

An up-to-date compilation of the many-named species, together with designated antibiotics produced by antagonistic strains.

6246* Occurrence of an Unknown Radioactive Substance After Short-Time Photosynthesis in $C^{14}O_2$. O. Kandler. *Archives of Biochemistry and Biophysics*, v. 73, Jan. 1958, p. 38-42.

Uptake of CO_2 in photosynthesis was stopped by adding high concentrations of cyanide to *Chlorella* suspensions after short-time exposure to $C^{14}O_2$. If illumination is continued for several sec. before the algae are extracted with alcohol, there is a strong change in the distribution of radioactivity between the different substances analyzed by paper chromatography. After dephosphorylation of the diphosphate area two new radioactive spots were noticed.

6247* The Effects of Steroids on the Growth of *Euglena gracilis*. D. E. Buetow and B. H. Levedahl. *Archives of Biochemistry and Biophysics*, v. 73, Jan. 1958, p. 273-276.

Investigations on a single cell system, by means of growth measurements, of not only a response to characteristic steroid hormones, but also of the interaction or "competition" between combinations of such steroids.

6248* The Toxicology of Epoxy Resins. Charles Henri Hine, Jiro K. Kodama, Hamilton H. Anderson, D. W. Simonson, and John S. Wellington. *Archives of Industrial Health*, v. 17, Feb. 1958, p. 129-144.

Epoxy resins have a low order of toxicity. The biological activity is considerably less than that of most monomers, and disappears on curing of the resins.

6249* (English.) On the Hydration of Macromolecules. X-Ray Diffraction Studies on Aqueous Solutions of Hyaluronic Acid. Torvard C. Laurent. *Arkiv för Kemi*, v. 11, no. 6, 1957, p. 503-512.

The hydration of hyaluronic acid solutions in concentrations below 2% changes the X-ray diffractogram of pure water only within the experimental errors ($<2\%$). Studies give no support for the hypothesis that hyaluronic acid forms large hydration shells with an increased four-coordinated hexagonal lattice structure.

6250* Antimicrobial Factors of Normal Tissues and Fluids. Robert C. Skarnes and Dennis W. Watson. *Bacteriological Reviews*, v. 21, Dec. 1957, p. 273-294.

A historical review with 187 references. Presents a generalization of the thermolabile antimicrobial and hemolytic systems of normal serum.

6251* The Use of [^{14}C] Amino Acids to Study Sites and Rates of Antibody Synthesis in Living Hyperimmune Rabbits. J. H. Humphrey and B. D. Sulitzeanu. *Biochemical Journal*, v. 68, Jan. 1958, p. 146-161.

6252* Formation of Specific Antibodies and γ-Globulin *in Vitro*. A Study of the Synthetic Ability of Various Tissues From Rabbits Immunized by Different Methods. Brigitte A. Askonas and J. H. Humphrey. *Biochemical Journal*, v. 68, Feb. 1958, p. 252-261.

Incorporation of the ^{14}C-label into antibody is due to synthesis and secretion of antibody by the tissue slices. Tissues stimulated to produce specific antibody also produced increased amounts of other γ-globulin which was not identified as specific antibody.

6253* (English.) Mechanisms of Antibody Globulin Synthesis by Lymphoid Tissue in *Vitro*. Abram B. Stavitsky and Benjamin Wolf. *Biochimica et Biophysica Acta*, v. 27, no. 1, Jan. 1958, p. 4-11.

Lymph nodes from immunized rabbits effect a net synthesis of antibody on a synthetic medium *in vitro*. Similarities between antibody synthesis and protein synthesis in microorganisms and mammalian tissues were indicated.

6254* (French.) The Genetic Continuity of the Chloroplasts in Euglena. La continuité génétique des chloroplastes chez les euglènes. I. Mechanism of the White Clone Formation in Cultures Treated With Streptomycin. Mécanisme de l'apparition des lignées blanches dans les cultures traitées par la streptomycine. M. De Deken-Grenson and S. Messin. *Biochimica et Biophysica Acta*, v. 27, no. 1, Jan. 1958, p. 145-155.

The results of a study of the percentage of white to green clones isolated by plating once per generation during the first phase of the phenomenon agree with the idea that all that streptomycin does is to selectively decrease the growth rate of the chloroplasts which, when lost, cannot be formed *de novo*.

6255 Biological Effects of Whole-Body Gamma Radiation on Human Beings (U). Harold O. Davidson. 101 p. 1957. John Hopkins Press, Baltimore. (RA1231.R2 D28b Over.)

A monograph concerning: radiation injury and recovery; human response to fallout radiation; applications to fallout defense problems; and delayed effects of irradiation.

6256* Optimum Group Size in Progeny Testing and Family Selection. Alan Robertson. *Biometrics*, v. 13, Dec. 1957, p. 442-450.

The optimum structure of the population and the probable genetic superiority of chosen groups are dependent on K, the heritability, h^2, and the genetic relationship within groups. The testing ratio, K, is the ratio of the number of individuals which can be measured each generation to the number of sires (or family groups) that are to be selected.

6257* Preparation of Cell Cultures From Human Amnion. Jean Ferguson and J. O'H. Tobin. *British Medical Journal*, 1958, Jan. 18, p. 144-146.

The method of preparing amnion cell cultures used in the Biological Standards Control Laboratory is described and is briefly compared with methods already reported.

6258* A Study in the Transmission of Maternal Antibodies. Hedley J. B. Atkins. *British Medical Journal*, 1958, Jan. 25, p. 187-190.

Anatomical and biochemical evidence is described supporting the view that, in the human, antibodies are transmitted from mother to offspring *in utero*.

6259 The Biosynthesis of Cell Wall Carbohydrates. IV. Further Studies on Cellulose and Xylan in Wheat. A. C. Neish. *Canadian Journal of Biochemistry and Physiology*, v. 36, Feb. 1958, p. 187-193.

Glucose was more readily converted to cellulose and xylan than several polysaccharides tested.

6260* Biosynthesis of Cobalamin Analogues by *Propionibacterium arabinosum*. D. Perlman and J. M. Barrett. *Canadian Journal of Microbiology*, v. 4, Feb. 1958, p. 9-15.

Examination by filter paper partition chromatography and filter paper ionophoresis of the cobalamins present in cultures of *Propionibacterium arabinosum* grown in a medium containing glucose, yeast extract, and salts showed that only adenine-hydroxo-cobalamin was present.

6261* The Latent Period in Carcinogenesis by Plastics in Rats and Its Relation to the Presarcomatous Stage. B. S. Oppenheimer, Enid T. Oppenheimer, Arthur Purdy Stout, Margaret Willhite, and I. Danishefsky. *Cancer*, v. 11, no. 1, Jan.-Feb. 1958, p. 204-213.

The sarcomas arise from cells in the pocket wall, the first sign of increased fibroblastic proliferation always appearing adjacent to the plastic, leading to the development of a neoplasm.

6262 CIBA Foundation Symposium on the Nature of Viruses. G. E. W. Wolstenholme and Elaine C. P. Millar. 292 p. 1957. Little, Brown and Co., Boston. (QR360 C48c)

A series of papers on the biophysics and biochemistry of viruses.

6263* (French.) Production of Multiple Cancers in AkR Mice Injected With an Isologous α-Cellular Leucemic Extract. **Production de cancers multiples chez des souris AkR ayant reçu un extrait leucémique α-cellulaire isologue.** Raymond Latarjet and Mario de Jaco. *Comptes Rendus*, v. 246, no. 3, Jan. 20, 1958, p. 499-501.

An α-cellular extract of AkR leucemia injected into new born AkR mice of the samo strain caused multiple cancers to develop in different forms and places in the five survivers between 80 and 130 days.

6264* (Russian.) Cultivation of Eye Cornea Tissue in an Organism. **Kultivirovanie tkanei rogovitsy glaza v organizme.** V. F. Pcheliakov. *Doklady Akademii Nauk SSSR*, v. 117, no. 2, Nov. 11, 1957, p. 317-319 + 1 plate.

6265 Insect Viruses and Their Structure. Kenneth M. Smith and Robley C. Williams. *Endeavour*, v. 17, Jan. 1958, p. 12-21.

Discusses the importance of insect viruses in fundamental virus research. A shadow-casting technique was used to demonstrate the geometric form of the particles of a virus in *Tipula paludosa* larvae.

6266* Ciné - Micrographic Studies on Mitosis in Endosperm. III. The Origin of the Mitotic Spindle. A. Bajer. *Experimental Cell Research*, v. 13, Dec. 1957, p. 493-502.

A clear zone, which is the cytoplasmic contribution to the mitotic spindle, forms around the nucleus, appearing in early prophase and rapidly enlarging in late prophase. The quantity of the substance which may migrate from the nucleus into the clear zone is very small.

6267* Inhibition of Cell Division by Ultraviolet Irradiated Unsaturated Fatty Acid. K. M. Wilbur, et al. *Experimental Cell Research*, v. 13, Dec. 1957, p. 503-509.

Ultra-violet irradiation of eggs of *Chaetopterus pergamentaceous* resulted in the formation of lipid peroxides. It is suggested that at least a part of the inhibiting action of ultra-violet irradiation is mediated through the formation of lipid peroxides.

6268* (German.) Effect of Polyethylene Pipes on the Bacteriological Condition of Water. **Beitrag zur Frage des Einflusses von Polyäthylen-Kunststoffrohren auf die bakteriologische Beschaffenheit des Wassers.** Rudolf H. Laun. *Gas- und Wasserfach*, v. 99, Ausgabe Wasser, no. 6, Feb. 7, 1958, p. 121-123.

Comparative bacteriological experiments were carried out to establish whether plastic pipes have any detrimental effect on the drinking water.

6269 X-Irradiation of the Exteriorized or *in situ* Intestine of the Rat. M. F. Sullivan, P. L. Hackett, S. Marks, and R. C. Thompson. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-52896, Jan. 1958, 32 p. (UF767 Un3.1hw Contin.)

Shows that irradiation of the intestinal tract following administration of an internal emitter may be followed by marked hematologic changes.

6270 Present Status of Heart Sound Production and Recording. (Symposium). *Institute of Radio Engineers, Transactions on Medical Electronics*, PGME-9, Dec. 1957, p. 1-55. (TK1 In6.6m Vis.)

6271* A Circulating Pump for Quantitative Estimation of Serial Radioisotope Uptake *in Vitro*. Donald R. Osgood, Julian D. Boyd, and Alvin S. Blum. *International Journal of Applied Radiation and Isotopes*, v. 3, no. 1, 1958, p. 43-44 + 1 plate.

The device permits the continuous circulation of the isotope solution from a small immersion chamber containing the specimen, through a coil surrounding a Geiger-Müller tube.

6272* The Third International Symposium on Radioisotopes in Clinical Medicine and Research. *International Journal of Applied Radiation and Isotopes*, v. 3, no. 1, 1958, p. 78-90.

Abstracts of papers.

6273* Bacterial Adrenaline Sensitizer on the Central Action of Adrenaline, Noradrenaline, and Serotonin. Takio Shimamoto, Toji Konishi, Monoru Koizumi, and Shigeo Iwahara. *Japan Academy, Proceedings*, v. 33, no. 9, Nov. 1957, p. 580-585.

Bacterial adrenaline sensitizer lowered the threshold values of l-adrenaline, l-noradrenaline, and serotonin for their inhibition of callosal potential and also augmented the effect.

6274 A Pilot Plant for the Continuous Culture of Micro-Organisms. R. W. Harrison. *Journal of Applied Chemistry*, v. 8, Jan. 1958, p. 68-72.

Describes an apparatus, based on Monod's bactogen, which will cultivate non-pathogens continuously.

6275* Theory of the Flow of Blood in Narrow Tubes. A. D. Maude and R. L. Whitmore. *Journal of Applied Physiology*, v. 12, Jan. 1958, p. 105-113.

The anomalous properties of blood when flowing through rigid tubes can be explained by considering the blood as a suspension of red cells in serum.

6276 Submerged Culture of Mammalian Cells: The Five Liter Fermentor. W. F. McLimans, F. E. Giardinello, E. V. Davis, C. J. Kucera, and G. W. Rake. *Journal of Bacteriology*, v. 74, Dec. 1957, p. 768-774.

A variety of conditions is described under which the growth of "L" cells has been attained in a 5-L fermentor which is a prototype of the antibiotic fermentors. The growth exhibited in this type of equipment establishes the feasibility of growing mammalian cells on a large scale in submerged culture.

6277 Bacterial Identification by Infrared Spectrophotometry. II. Effect of Instrumental and Environmental Variables. Bernard A. Kenner, Jackson W. Riddle, Sue W. Rockwood, and Robert H. Bordner. Journal of Bacteriology, v. 75, Jan. 1958, p. 16-20.

Comparable spectra of bacteria can be measured when "standardized" conditions are maintained. The instrumentation methods must also be maintained as constants at all times by regular adjustments.

6278* A Serum Albumin Precursor in Cytoplasmic Particles. Theodore Peters, Jr. *Journal of Biological Chemistry*, v. 229, Dec. 1957, p. 659-677.

6279* Preparation and Isolation of Fatty Acids Randomly Labeled With C^{14}. Helmut K. Mangold and Hermann Schlenk. *Journal of Biological Chemistry*, v. 229, Dec. 1957, p. 731-741.

This paper describes the photosynthesis of randomly labeled fat by *Chlorella pyrenoidosa* and the isolation of the individual fatty acids.

6280* Pathways of Ribonucleic Acid Pentose Biosynthesis by Lymphatic Tissues and Tumors. Saul Kit, Jean Klein, and Odette L. Graham. *Journal of Biological Chemistry*, v. 229, Dec. 1957, p. 853-863.

The results suggest that both the transketolase-transaldolase pathway and the direct oxidative pathway may be of importance in the synthesis of the ribose moiety of RNA by lymphatic cells and tumors.

6281* Binding and Distribution of Intravenously Injected C^{14}-Steroids and Their Metabolites in Human Plasma and Its Fractions. H. N. Antoniades, R. B. Pennell, W. R. Slaunwhite, Jr., and A. A. Sandberg. *Journal of Biological Chemistry*, v. 229, Dec. 1957, p. 1071-1079.

The purpose of this study was to examine the binding of steroid hormones and their metabolites to plasma proteins and to find their distribution *in vivo* among the plasma protein fractions. The steroids used were labeled with C^{14}.

6282* Evidence for Two Metabolically Distinct Types of Ribonucleic Acid in Chromatin and Nucleoli. Rachel McMaster-Kaye and J. Herbert Taylor. *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 1, Jan. 1958, p. 5-11.

Patterns of radioisotope incorporation are useful characteristics in describing cellular RNA fractions, and have indicated a distinctive "nuclear" RNA.

6283* An Electron Microscope Study of Lampbrush Chromosomes. Jean G. Lafontaine and Hans Ris. *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 1, Jan. 1958, p. 99-105 + 4 plates.

Evidence that the loops, axis, and the chromomeres of lampbrush chromosomes are formed by two chromonemata.

6284* A Method for the Study of Cultured Cells by Thin Sectioning and Electron Microscopy. Allan F. Howatson and June D. Almeida. *Journal of Biophysical and Biochemical Cytology*, v. 4, no. 1, Jan. 1958, p. 115-117 + 2 plates.

A method is described which allows cells growing on a glass surface to be sectioned parallel to the surface.

6285 Chromatographic Separation and Identification of Some Alkaloid Metabolites of Nicotine in Certain Insects. F. E. Guthrie, R. L. Ringler, and T. G. Bowery. *Journal of Economic Entomology*, v. 50, Dec. 1957, p. 821-825.

A study of the metabolism of nicotine in topically treated American and German cockroaches showed that the main metabolite was cotinine or a similar compound. A number of yet unidentified metabolites were found in similar tests on the southern armyworm.

6286* A Serum Albumin Medium for the Cultivation of Human Epithelial-Like Cells. R. Shihman Chang and Robert P. Geyer. *Journal of Immunology*, v. 79, Dec. 1957, p. 455-461.

Human and equine albumin, diluted in Eagle's basal medium plus inositol sustained satisfactorily the *in vitro* multiplication of the conjunctival, liver, appendix, HeLa, HEP, KB, Detroit-6, fresh human kidney and amnion cells.

6287* Human Cells in Continuous Culture. II. Comparative Susceptibility of Stable and Clonal-Strain Epithelial Cells to Infection by Viruses of Poliomyelitis, Vaccinia or Herpes Simplex. Leroy C. McLaren and Jerome T. Syverton. *Journal of Immunology*, v. 79, Dec. 1957, p. 484-488.

For practical purposes comparative susceptibility was defined as the relative efficiency of cell cultures as instruments for virus assay.

6288* An Atypical Carcinoid Tumour Secreting 5-Hydroxytryptophan. M. Sandler and P. J. D. Snow. *Lancet*, v. 1, Jan. 18, 1958, p. 137-139.

6289* Blood-Groups in Tumours of Salivary Tissue. J. Malcolm Cameron. *Lancet*, v. 1, Feb. 1, 1958, p. 239-240.

The distribution of ABO blood-groups among 341 patients with tumors of salivary tissue was determined, and the frequency of group A was significantly higher.

6290 Light, Colour and Vision. Yves Le Grand. (Translated from the French by R. W. G. Hunt, J. W. T. Walsh, and F. R. W. Hunt.) 512 p. 1957. John Wiley & Sons, New York. (QP475 L52Ltr)

A textbook emphasizing the physical aspects of the reaction of the retina when its light-sensitive cells absorb light of various wave-lengths.

6291 Estimation of Whole Body Dose (REM) From Tritium in Body Water. James N. P. Lawrence. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2163, Feb. 1958, 22 p. (UF767 U3La Contin.)

A method of detecting tritium in the body by urinalysis.

6292* Pharmacophysiologic Principles in the Use of Corticoids and Adrenocorticotropin. Vincent C. DiRaimondo and Peter H. Forsham. *Metabolism: Clinical and Experimental*, v. 7, Jan. 1958, p. 5-24.

The rationale for anti-inflammatory and anti-allergic corticotropin and corticoid therapy is presented.

6293 Molecular Structure and Biological Specificity. Linus Pauling and Harvey A. Itano, editors. 195 p. 1957. American Institute of Biological Sciences, Washington, D. C. (QD476 P28m)

Discusses current research being carried out on biological specificity. Includes a discussion and summary of reports by Pauling.

6294* (Russian.) Left and Right Handedness in the Structure of Plants and Animals. **Levizna-pravizna v stroenii rastitel'nykh i zhivotnykh organizmov.** V. V. Alpatov. *Moskovskoe Obshchestvo Ispytatelei Prirody. Biulleten' Otdel Biologicheskii*, v. 62, no. 5, Sept.-Oct. 1957, p. 19-27.

Populations of organisms with different degrees of dextrality are not proportionately distributed over the globe, a high degree of dextrality being found in glacial relict populations. The author concludes that in living organisms the optical activity of protoplasm and the prevalence of left or right molecules gives certain advantages in comparison to the racemic state.

6295* On the Magnetic Asymmetry of Muscle Fibers. William Arnold, Richard Steele, and Helmut Mueller. *National Academy of Sciences of the United States of America, Proceedings*, v. 44, Jan. 1958, p. 1-4.

Muscle fiber is anisotropic in its magnetic properties.

6296* Molecular Growth Requirements of Single Mammalian Cells: The Action of Fetuin in Promoting Cell Attachment to Glass. Harold W. Fisher, Theodore T. Puck, and Gordon Sato. *National Academy of Sciences of the United States of America, Proceedings*, v. 44, Jan. 1958, p. 4-10.

Fetuin is fully active as the factor required for attachment and stretching of S3 HeLa cells on glass. The mechanism of this action of Fetuin may be a reflection of its ability to inhibit tryptic digestion of outer-cell-wall proteins.

6297* Activation of Hydrogen Transfer Between Pyridine Nucleotides by Steroid Hormones. Paul Talalay and H. G. Williams-Ashman. *National Academy of Sciences of the United States of America, Proceedings*, v. 44, Jan. 1958, p. 15-26.

Soluble enzyme preparations of human placenta promote the transfer of H from TPNH to DPN in the presence of minute amounts of certain steroid hormones.

6298 Antibody Production by Lymphocytes After *in vitro* Contact With Bacterial Antigen and Transfer to New-Born Rabbits. Miroslav Holub. *Nature*, v. 181, Jan. 11, 1958, p. 122.

Lymphocytes from cisterna chyli can form antibodies after transfer to new-born animals, the metabolic change being connected or followed by morphological transformation of some of the less-mature cells into the macrophage and plasma-cell types.

6299 A Possible Basis for Phyto-Immunity. D. H. Taysum. *Nature*, v. 181, Jan. 18, 1958, p. 174-175.

Describes the agglutinating reactions of *Hevea* latex.

6300 Inhibition of Carotenoid Synthesis in Photosynthetic Bacteria. Germaine Cohen-Bazire and R. Y. Stanier. *Nature*, v. 181, Jan. 25, 1958, p. 250-252.

The restoration of colored carotenoids is accompanied by a rapid diminution of the induced photosensitivity. Reversible physiological induction of photosensitivity is correlated with changes in carotenoid content.

6301 Autoradiographic Visualization of Synthesis of Deoxyribonucleic Acid in Tissue Culture With Tritium-Labelled Thymidine. H. Firket and W. G. Verly. *Nature*, v. 181, Jan. 25, 1958, p. 274-275.

Tritium-labelled thymidine is a very useful tool for the cytological study of many aspects of the synthesis of deoxyribonucleic acid.

6302 Adenosine Triphosphate Metabolism in the Rabbit Erythrocyte *in Vivo*. Bertram A. Lowy, Bracha Ramot, and Irving M. London. *Nature*, v. 181, Feb. 1, 1958, p. 324-326.

A study to determine the extent to which the purine moiety arises from glycine-2-^{14}C, a known precursor of purines.

6303 Distribution of Tritium-Labelled Thymidine in *Escherichia Coli* During Cell Multiplication. R. B. Painter, F. Forro, and W. L. Hughes. *Nature*, v. 181, Feb. 1, 1958, p. 328-329.

Study of the distribution of the incorporated label among the daughters of labelled cells following growth on unlabelled medium.

6304 A Hypothesis for the Biosynthesis of Ribonucleic Acid and Protein. A. M. Michelson. *Nature*, v. 181, Feb. 8, 1958, p. 375-377.

6305 Second Conference on Sulfonamides. Otto V. St. Whitelock, editor. *New York Academy of Sciences, Annals*, v. 69, Art. 3, Oct. 1957, p. 377-524. (Q11 N49a Contin.)

Seventeen papers including several on clinical uses.

6306* Labile Biocolloids, Cell Division, and the Structure of the Mitotic Apparatus. Paul R. Gross. *New York Academy of Sciences, Transactions*, v. 20, Dec. 1957, p. 154-172.

A discussion of the problem of the structure-assembly of endoplasm.

6307 Organic Colloids. Bruno Jirgensons. 655 p. 1958. Elsevier Publishing Company, New York. (QD549 J56o)

A general survey of organic colloids, which emphasizes basic facts and relationships rather than theory. The first part presents a review of the methods of preparation and study of organic colloids. The second part presents a condensed systematic survey of the most important classes of molecular and micellar colloids.

6308 Physical Methods in Physiology. W. T. Catton. 375 p. 1957. Philosophical Library, New York. (QP55 C29p)

Blood; circulation; respiration; physical basis of body heat exchangers.

6309* Effects of Oxygen and Red Light Upon the Absorption of Visible Light in Green Plants. Britton Chance and Bernard Strehler. *Plant Physiology*, v. 32, no. 6, Nov. 1957, p. 536-548.

Absorption changes caused by dim illumination are associated with oxygenation of the cells. The spectroscopic effects caused by oxygenation and low intensity illumination are found to differ in significant details from those caused by high illumination of the aerobic cells.

6310* Rubber Biosynthesis in Latex of *Hevea brasiliensis*. Robert S. Bandurski and Howard J. Teas. *Plant Physiology*, v. 32, no. 6, Nov. 1957, p. 643-648.

Report of the first *in vitro* synthesis of rubber. Discusses the advantages of the latex system for the biosynthesis of terpenoids.

6311* Stages at Death of X-Ray-Induced Embryo Lethals in Haploids and in Heterozygotes of *Habrobracon*. Anna R. Whiting, Sarah Caspari, Melpomeni Koukides, and Priscilla Kao. *Radiation Research*, v. 8, Feb. 1958, p. 195-202.

This study demonstrates that, for X-ray-induced embryo lethals, dominants in haploids, dominants in heterozygotes, and recessives in haploids kill at increasingly later stages.

6312 Radiological Physics. M. E. J. Young. 365 p. 1957. Academic Press, New York. (QC475 Y86r)

Discussion of various aspects of radiology including clinical equipment use, treatment planning, and dose calculation.

6313 Research in Photosynthesis. H. Gaffron, A. H. Brown, C. S. French, R. Livingston, E. I. Rabinowitch, B. L. Strehler, and N. E. Tolbert, editors. 524 p. 1957. Interscience Publishers, New York. (QK882 G12r)

Contains over 60 indexed papers on the problem of the primary photochemical process in photosynthesis, including those secondary reactions which seemed most likely to furnish clues to the mechanism of the primary process.

6314 Strontium-90 in Man. II. Walter R. Eckelmann, J. Laurence Kulp, and Arthur R. Schulert. *Science*, v. 127, Feb. 7, 1958, p. 266-274.

New data permitting a closer definition of the average concentration of Sr^{90} in a large part of the human race; the geographical and dietary variation; the increase in the concentration with time; and the distribution in urban populations.

6315 Displacement of Serotonin From Tissues by a Specific Antimetabolite. D. W. Woolley and P. M. Edelman. *Science*, v. 127, Feb. 7, 1958, p. 281-282.

6316* Propagation of Measles Virus in Cultures of Chick Embryo Cells. Samuel L. Katz, Milan V. Milovanovic, and John F. Enders. *Society for Experimental Biology and Medicine, Proceedings*, v. 97, Jan. 1958, p. 23-29.

An egg-adapted strain has been propagated through 24 serial passages. Concentration of virus is comparable to that in cultures of infected primate cells.

6317* Metabolism of Human Amnion Cell Cultures Infected With Poliomyelitis Virus. I. Glucose Metabolism During Virus Synthesis. Yechiel Becker, N. Grossowicz, and H. Bernkopf. *Society for Experimental Biology and Medicine, Proceedings*, v. 97, Jan. 1958, p. 77-82.

A typical growth curve of poliovirus type II in human amnion cell cultures is reported. Inhibitors of the oxidative pathways of glucose metabolism affected neither cell maintenance nor virus reproduction. It is assumed that glycolytic rather than oxidative processes are important for reproduction of poliovirus within human amnion and monkey kidney cell cultures.

6318* Demonstration of Differences Between Normal and Tumor-Bearing Animals. Vernon Riley. *Society for Experimental Biology and Medicine, Proceedings*, v. 97, Jan. 1958, p. 169-175.

A simple experimental procedure is reported which can demonstrate a significant difference in response between certain tumor-bearing mice and their normal controls. The procedure involves challenging the two groups of animals with a lethal dose of a compound capable of reacting with the tumor or one of its metabolites. Either the cancerous or the normal animals may survive longer, depending upon both the type of tumor and the molecular configuration of the compound utilized.

6319* Host-Virus Relationships in Rous Sarcoma Tissues *in vitro*. I. Growth of Extraneous Viruses. David H. Smith and Herbert R. Morgan. *Society for Experimental Biology and Medicine, Proceedings*, v. 97, Jan. 1958, p. 212-218.

The ability of four animal viruses (NDV, NWS, vaccinia, and psittacosis) to propagate in Maitland-type tissue cultures of chick embryo and adult chick fibroblastic tissues and Rous sarcoma tissue was studied. All four viruses were found capable of proliferation in the embryo tissue, while only NDV and vaccinia virus multiplied in the adult chick and Rous sarcoma tissue cultures.

6320* Measuring and Counting Small Particles. Albert L. Thomas, Jr. *Southern Research Institute, Bulletin*, v. 10, no. 3, 1957, p. 14-18.

Discussion of various methods of rapid measuring of the concentration and size distribution of aerosols; e.g. charge particles electrically and count the charge pulses, or the use of a photoelectric particle counter.

6321 Alkaloid Studies. XIX. Alkaloids of Some Hawaiian *Rauwolfia* Species: The Structure of Sandwicine and Its Interconversion With Ajmaline and Ajmalidine. M. Gorman, N. Neuss, C. Djerassi, J. P. Kutney, and P. J. Scheuer. *Tetrahedron*, v. 1, no. 4, 1957, p. 328-337.

The alkaloid composition of the following three Hawaiian *Rauwolfia* species, *R. sandwicensis* A.DC., *R. degeneri* Sherff and *R. mauiensis* Sherff was determined. There were encountered trace amounts of two new dihydroindole alkaloids, mauiensine and sandwicensine as well as larger quantities of an isomer of ajmaline, which was named sandwicine ($C_{20}H_{26}N_2O_2$).

6322 Tracer Applications for the Study of Organic Reactions. John G. Burr, Jr. 291 p. 1957. Interscience Publishers, New York. (QD73 B94t)

Comprehensive survey of tracer applications in organic chemistry and some generalized principles of isotopic tracer use.

6323 Ultrasound in Biology and Medicine. Elizabeth Kelly, editor. 243 p. 1957. American Institute of Biological Sciences, Washington, D. C. (QC244 K29u)

Papers from a symposium covering: ultrasonic visualization of soft tissues; neurosonicsurgery; ultrasonic lesions; histology of tissue changes induced by ultrasound, and determination of blood velocity.

6324* A Small-Animal Analytical Respirometer. Arnold W. Pratt. *U. S. National Cancer Institute, Journal*, v. 20, no. 1, Jan. 1958, p. 161-172.

Describes new respirometer designed for continuous study of the expiratory exchanges of small experimental animals.

6325* Observations on the Energy Metabolism of Rats Receiving Walker Tumor 256 Transplants. A. W. Pratt and F. K. Putney. *U. S. National Cancer Institute, Journal*, v. 20, no. 1, Jan. 1958, p. 173-187.

Implantation and subsequent growth of Walker carcinosarcoma 256 tumor in the Osborne-Mendel strain of rat is associated with an increased total energy expenditure, a progressive reduction in food intake, and therefore, a progressive decrease in energy retention.

6326 Techniques for the Visualization of Internal Organs by an Automatic Radioisotope Scanning System. William J. MacIntyre, Abbas M. Rejali, James H. Christie, Frank S. Gott, and Thomas S. Houser. *Western Reserve University, School of Medicine (U. S. Atomic Energy Commission)*, NYO-2056, Dec. 1957, 36 p. (UF767 U3ny Contin.)

Clinical examples of the visualization of the thyroid, liver, and heart with these techniques are presented.

6327* (Polish.) Modern Conceptions of Photosynthesis. **Współczesne poglady na fotosyntezę.** Waclaw Hendrich. *Wiadomości Chemiczne*, v. 11, Oct. 1957, p. 570-593.

Definition and description of the photosynthetic reaction. Granular and homogeneous structure of the chloroplasts. Percentage of proteins and lipids. Chlorophyll combination in colloid or lipoid solution or with chloroplast albumen. Mechanism and intermediate products of photosynthesis.

See also: **6229** (chromatographic method for studying simple compounds in plants); **6232** (vertical translocation of antibiotics in plants); **6233** (bacterial synthesis of growth factors); **6234** (phosphate uptake in plants); **6421** (analysis of small tissue samples); **6506** (chemistry and structure of bottromycin); **6507** (synthesis of potential anticancer agents); **6529** (X-ray diffraction of hyaluronic acid); **6592** (uronic acids in gelatins); **6593** (cupric complexes and amino acids); **7041** (medical cataloging); **7696** (sulfidizing lignin).

CERAMICS AND CONCRETE

6328* (Spanish.) Basic Considerations on the Use of Refractory Materials. **Consideraciones fundamentales sobre el empleo de los materiales refractarios.** Luis Dalmau Castells. *Acero y Energia*, v. 14, no. 84, Nov.-Dec. 1957, p. 37 + 12 pages.

Study of silica refractories from the economic viewpoint. Purchasing price, physical and chemical conditions when acquired, and working conditions in service.

6329* (German.) Relationship Between Structure and Physical Properties of Glass. **Zusammenhang zwischen der Struktur und den physikalischen Eigenschaften des Glases. I.** I. Náray-Szabó. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 37-64.

The basic structure of glass is an infinite tetrahedral skeleton consisting of skeleton-building oxides such as SiO_2, B_2O_3, BeO, Al_2O_3, P_2O_5 and sometimes the BO_3 triangles.

6330* (Russian.) Electrical Properties of Phosphate Glasses. **Elektricheskie svoistva fosfatnykh stekol.** V. P. Petrosian. *Akademiia Nauk Armianskoi SSR, Izvestiia*, v. 10, no. 5, 1957, p. 315-331.

The glasses studied had the following compositions: $xMeO \cdot yP_2O_5$ (Me=Pb, Ba, Ca, Zn, Mg), and $xMe_2O \cdot yAl_2O_3 \cdot zP_2O_5$ (Me=Li, Na, K). Dielectric losses of the two-component glasses at 10^3 c.p.s. in a wide temperature range do not depend on temperature, and at higher temperatures decrease with the increase of x. Tin ions cause the highest losses.

6331 Technical Aspects of Vitrified Grinding Wheel Manufacture. I. Introduction. M. W. Gormly. *American Ceramic Society Bulletin*, v. 37, Feb. 1958, p. 77-80.

An introduction to the grinding wheel industry, a description of the marking system, and a discussion of the basic elements of the formula system.

6332 Phase Equilibria at High Temperatures in Iron Silicate Systems. Arnulf Muan. *American Ceramic Society Bulletin*, v. 37, Feb. 1958, p. 81-84.

Methods for determining and describing phase equilibria in oxide systems involving changes in oxidation states. Iron oxide containing silicates are used as examples to demonstrate the principles.

6333 Kiln Car Bearing Lubricants. William C. Kiefer and Henry A. Bedell. *American Ceramic Society Bulletin*, v. 37, Feb. 1958, p. 85-90.

Concise information regarding all types of lubricants and their proper application. Effects of time, temperature, load, and atmosphere on various greases and oils.

6334 The Use of Refractory Ceramics in Rocket Engines. Wm. R. Sheridan. *American Ceramic Society Bulletin*, v. 37, Feb. 1958, p. 91-94.

Use in liquid propellant rocket engines. The conditions encountered, and desirable properties of an ideal material. Materials which have been successfully used.

6335 The Mechanism of Lightweight Aggregate Formation. Ernest G. Ehlers. *American Ceramic Society Bulletin*, v. 37, Feb. 1958, p. 95-99.

A study of six shales indicated that bloating was caused by evolution of CO_2 during the thermal decomposition of $CaCO_3$ and $Ca(Fe,Mg)(CO_3)_2$ (ankerite). The samples must be fired rapidly to prevent escape of CO_2 as the carbonates decompose in the interior.

6336 Initial Sintering of Alumina and Hematite. R. L. Coble. *American Ceramic Society, Journal*, v. 41, Feb. 1958, p. 55-62.

Experimental measurements of the rate of shrinkage of pressed Al_2O_3 compacts, the neck growth between single-crystal Al_2O_3 spheres and plates, and the effect of particle size on neck growth between single-crystal Al_2O_3 spheres and plates are mutually consistent with the bulk diffusion sintering model. The temperature dependence of the rate of shrinkage and neck growth in Al_2O_3 is characterized by an activation energy of 165 kcal. per mole. Apparent diffusion coefficients and temperature dependence calculated from the shrinkage of pressed compacts of Fe_2O_3 agree with measured diffusion coefficients for the diffusion of Fe in Fe_2O_3.

6337* Re-Proportioning of Concrete Mixtures for Air Entrainment. H. J. Gilkey. *American Concrete Institute, Journal*, v. 29, Feb. 1958, p. 633-645; *ACI Proceedings*, v. 54, 1958, p. 633-645.

Summaries of current knowledge and problems of mixture reproportioning are presented and illustrated with unit-block solid-volume diagrams. Range of mixtures, from rich to lean, is covered for a structural grade concrete of 3-in. slump and a nominal 4% of entrained air.

6338 (German.) Investigations of the SiO_2-Al_2O_3 System. **Untersuchungen im System SiO_2-Al_2O_3.** G. Trömel, K. H. Obst, K. Konopicky, H. Bauer, and I. Patzak. *Berichte der Deutschen Keramischen Gesellschaft*, v. 34, no. 12, Dec. 1957, p. 397-402.

Survey of previous work. Investigations with very pure initial substances on the side rich in Al_2O_3 in the SiO_2-Al_2O_3 system. Stability of mullite at high temperatures. Decomposition above 1810 C.

6339* (Russian.) Heat Treatment of Concrete. **K voprosu termoobrabotki betona.** S. V. Shestoperov and L. I. Panfilova. *Beton i Zhelezobeton*, no. 1, Jan. 1958, p. 19-22.

Laboratory experiments to determine the effect of temperature of steam, duration of isothermic heating, and water content of concrete mixtures on strength and durability of the end product. Data and establishment of an optimum procedure which improves the quality and decreases the cost.

6340 Rapid Analysis of Some Silicate Materials. H. Bennett, W. G. Hawley, and R. P. Eardley. *British Ceramic Society, Transactions*, v. 57, Jan. 1958, p. 1-28.

Procedures for the rapid analysis of clay and of certain fired products containing only the usual oxides. The main limitations of the method are that the sample should be completely decomposed, either by treatment with HF and H_2SO_4, or by fusion in NaOH.

6341 Spectrographic Analysis of Some Minor Constituents in Refractories. D. D. Innes. *British Ceramic Society, Transactions*, v. 57, Jan. 1958, p. 29-37.

A method for the determination of Fe_2O_3, TiO_2, CaO, MgO, ZrO_2, K_2O, and Na_2O in refractory materials, and the possibility of the estimation of Al_2O_3. Application of the cathode layer technique in the analysis.

6342* **Ball-Mill Grinding. I.** J. Nijman. *British Chemical Engineering*, v. 3, Feb. 1958, p. 76-80.

The mechanism of the breakage process in ball-mill grinding is discussed along with a critical review of existing laws and theories of size distribution and breakage probability.

6343 Ceramics for Solid Propellant Rocket Engines. R. G. Higginbotham and M. J. Kemp. *Ceramic Age*, v. 71, Feb. 1958, p. 28 + 4 pages.

Various materials were tested as nozzle insert materials in high-energy solid propellant rocket engines operating at a variety of chamber pressures and burning times.

6344 Raw Materials for Electronic and New Ceramics. *Ceramic Industry*, v. 70, Jan. 1958, p. 72 + 8 pages.

Formulas and physical properties of materials for technical ceramics.

6345 A Complete Directory of Ceramic Materials. *Ceramic Industry*, v. 70, Jan. 1958, p. 89 + 45 pages.

Data on various materials of interest in the ceramic industry, including formulas, properties, and uses.

6346* (Italian.) Possibility of Theoretical Prediction of the Resistance of Refractories to Thermal Shocks. **Possibilità di previsione teorica della resistenza dei materiali refrattari alle sollecitazioni termiche.** Leopoldo Massimilla and Gianni Astarita. *Fonderia*, v. 6, no. 12, Dec. 1957, p. 549 + 3 pages.

Developing a method of theoretical prediction based on the thermal diffusibility of the material. The thermal dilatation, thermal stresses, and fracture phenomena.

6347 Extrusion of Uranium Dioxide Fuel Cores. D. R. Stenquist and R. J. Anicetti. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-51747, Dec. 1957, 11 p. (UF767 Un3.1hw Contin.)

Rods with densities greater than 93% of the theoretical were fabricated from MCW "PWR grade" UO_2, and from UO_2 reduced from Hanford depleted UO_2. A density 96% of the theoretical was obtained with extruded "ceramic grade" UO_2 powder having a surface area of 2.0 m^2/g.

6348 Critical Study of the Optical and Mechanical Properties of Glass Fibers. Sidney Bateson. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 13-21.

Structure; elastic properties; refractive index; strength.

6349 Stress-Enhanced Diffusion in Glass. I. Glass Under Tension and Compression. Kenneth B. McAfee, Jr. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 218-229.

New technique for determination of diffusion constants of gases in gas-solid systems demands a careful analysis of the transient quantity of gas flowing after the gas pressure at the boundary is discontinuously changed. Exact quantity of gas flowing is recorded by a mass spectrometer. The method was used to study the effect of high tensile stress upon the diffusion constant of He and other gases in glass.

6350* (English.) **Loss in Prestress of Post-Tensioned Members Due to Creep and Shrinkage of Concrete.** Shizuo Ban, Kiyoshi Okada, and Hiroshi Muguruma. *Kyoto University, Engineering Research Institute Technical Reports*, v. 7, no. 5, Oct. 1957, p. 81-114.

Prestress loss was measured in various types of post-tensioned beams, especially in terms of the effects of eccentricity in resultant prestress and additional reinforcement upon the prestress loss.

6351 The Friction Coefficients of Graphite at Extreme Temperatures. Paul Wagner and Allen R. Driesner. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, LA-2146, Jan. 1958, 20 p. (UF767 U3La Contin.)

Static and kinetic friction coefficients were measured as a function of surface conditioning and temperature up to a maximum temperature of 2450 C. The most significant effect was found to be due to the conditioning of the contact surfaces by polishing action.

6352 New Alumina-Type Cerments. Thomas F. Frangos. *Materials in Design Engineering*, v. 47, Feb. 1958, p. 112-115.

Cermets of Al_2O_3 with Cr, Mo, and W are oxidation resistant, have useful strengths at temperatures over 2200 F, and have excellent resistance to wear caused by friction, abrasion and erosion occurring over a wide temperature range. They are produced by slip casting, permitting great flexibility of design in both size and shape and allowing the incorporation of undercuts and intricate internal or external contours.

6353* (German.) The Vitreous Condition in Atomic and Molecular Theory. **Der Glasige Zustand in atomistischer und in molekularer Auffassung.** H. Salmang. *Naturwissenschaften*, v. 45, no. 1, 1958, p. 4-6.

In glass, ion structures coexist with molecular bonds; demarcation is not yet possible.

6354 Literature Abstracts of Ceramic Applications of Nepheline Syenite. C. J. Koenig. *Ohio State University, Engineering Experiment Station, Bulletin No.* 167, v. 27, no. 1, Jan. 1958, 63 p. (TA21 O3b Vis.)

The period 1910 to 1957 is covered.

6355* **Cement Mill Lubrication. I.** M. S. Clark. *Pit and Quarry*, v. 50, Feb. 1958, p. 82 + 4 pages.

Composition and types of cement; additives in cement; manufacturing processes; lubrication of various types of cement mill, quarry, and crushing machinery.

6356 The Effect of Phosphate in Portland Cement Clinker. Harold H. Steinour. *Portland Cement Association Research Department Bulletin* 85, Dec. 1957, 24 p. (TP883 P83b Vis.)

A review of foreign and previously unpublished American work. Equations for rational design of raw mix. Phosphate in clinker reduces both the lime limit and the maximum possible tricalcium silicate content.

6357* (French.) A New Process for the Study of Hardenable Cement Pastes With an Electron Microscope. **Nouveau procédé pour l'étude au microscope électronique des pâtes de ciment susceptibles de durcissement.** P. Bernard. *Revue des Matériaux de Construction*, C, 1957, no. 507, Dec., p. 351-361.

Specimens are protected against any changes, especially calcification by atmospheric CO_2, until hydration occurs. Advanced stages of hardening and its effects can be investigated.

6358 Effect of Frost in Building Materials. I. Baked Clay. *R.I.L.E.M. International Association of Testing and Research Laboratories for Materials and Structures, Bulletin*, 1957, nos. 36-37, 104 p.

Reports current research on frost effects in baked clay products, relations between frost resistance and physical properties, and methods of testing.

6359 (French.) Behavior of Concrete and Concrete Products Exposed to Industrial Atmospheres and to Contact of Waste Water. **Comportement du béton et des produits en béton exposés à des atmosphères industrielles et soumis au contact d'eaux résiduelles.** H. Lafuma. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 24, no. 1, Jan. 1958, p. 20-25.

Complexity of attack of concrete by physical, chemical, and mechanical means simultaneously. Acid and saline attack. Protection of the steel in reinforced concrete. Cracking caused by industrial atmospheres.

6360* (English.) **Porosity and Refractory Corrosion.** T. S. Busby. *Silicates Industriels*, v. 23, no. 1, Jan. 1958, p. 9-16.

The corrosion of refractories by glasses is substantially lowered by reducing porosity. Glass composition affects the corrosion porosity relationship.

6361* (French.) A Contribution to the Study of the Reactions in the Solid State and at High Temperatures in the Systems TiO_2-Al_2O_3, TiO_2-Cr_2O_3, and TiO_2-Cr_2O_3-Al_2O_3. **Contribution à l'étude des réactions à l'état solide à hautes températures dans les systèmes TiO_2-Al_2O_3, TiO_2-Cr_2O_3, TiO_2-Cr_2O_3-Al_2O_3.** Michelle Hamelin. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1421-1431.

Determination of solubilities and phase transformations.

6362* (French.) Qualitative Evaluation of the Diffusion of Fe_2O_3 in Quartzites and Silicious Products by Means of the Radioactive Tracer Element Fe-59. **Evaluation qualitative de la diffusion de Fe_2O_3 dans les quartzites et produits siliceux a l'aide du traceur radioactif Fe 59.** W. Szymborski and S. Pawlowski. *Société Française de Céramique, Bulletin No.* 37, Oct.-Dec. 1957, p. 3-9.

Cubic test pieces with 20 mm. sides were prepared having one face coated with a layer of isotope of 6.10^{-5}mC. The test pieces were fired at 1460 C. The depth of the zone of diffusion and migration of the ferric or ferrous oxides was then determined by measuring the depth of the zone of radiation in the sections of each test piece.

6363* (French.) The Morphology, Size, and Distribution of Pores in Ceramic-Products Capillarometry. **La morphologie des pores dans les produits ceramiques leurs dimensions et leur repartition capillarometrie.** P. Brémond. *Société Française de Céramique, Bulletin No.* 37, Oct.-Dec. 1957, p. 23-28.

Variable characteristics of fine structure affect the technical properties of products. The method and apparatus described are based on Jurin's law, whereby the diameter of a capillary tube immersed in a liquid can be measured by the air pressure required to clear it. Measurements of volume of air flow enable a representative value to be calculated for the numbers of pores intermediate to the selected diameter sizes.

6364* (French.) The Colorimetric Titration of Alumina in Silica Bricks. **Expose d'un dosage colorimetrique de l'alumine dans le cas des briques de silice.** J. André. *Société Française de Céramique, Bulletin No.* 37, Oct.-Dec. 1957, p. 59-71.

Results from analyses of the same standard sample of silica brick using a colorimetric method for the titration of Al_2O_3 by aluminon and using the traditional gravimetric method, whereby Al_2O_3 is obtained by difference from R_2O_3-(Fe_2O_3 + TiO_2). This set of tests is also used to investigate the variance obtained by colorimetric titration of Fe_2O_3 and TiO_2.

6365* (French.) Some Thermal Anomalies of Zirconia. **Quelques anomalies thermiques de la zircone.** J. Méneret. *Société Française de Céramique, Bulletin No.* 37, Oct.-Dec. 1957, p. 87-93.

By differential thermal analysis, an endothermic phenomenon was detected during the heating of a pure zirconia sample in the region of 1100 to 1200 C. An investigation was made of changes caused by this phenomenon in the stabilization of ZrO_2.

6366* (French.) Color Control in the Ceramic Industry. **Controle des couleurs dans l'industrie ceramique.** C. Leleu. *Société Française de Céramique, Bulletin No.* 37, Oct.-Dec. 1957, p. 95-105.

Briefly reviews the principles of tri-stimulus colorimetry. A color control method is proposed for glazed tile utilizing the Hunter differential colorimeter, and enabling color differences between a sample and a specified control piece to be easily expressed in figures by the Judd formula.

6367* (French.) Elasticity Phenomena in Plastic Ceramic Pastes. **Phenomenes d'elasticite des pates plastiques Ceramiques.** A. Baudran and C. Deplus. *Société Française de Céramique, Bulletin No.* 37, Oct.-Dec. 1957, p. 127-134.

An apparatus for recording the distortion of a test piece under a specified constant stress, especially devised for the study of elastic distortion in ceramic bodies is described. By its use the influence of water content of the body, distortion undergone by the body, and duration of the stress in elastic distortion were established.

6368* (Russian.) Stability of Industrial Glasses Subjected to Gamma Radiation. **Ob ustoichivosti promyshlennyk stekol k vozdeistviiu gamma-luchei.** S. M. Brekhovskikh. *Steklo i Keramika*, v. 15, no. 1, Jan. 1958, p. 10-14.

Samples of 18 different industrial glasses were subjected to irradiation with Co^{60} of the following dosage: 10^2; $5\cdot10^2$; 10^3; $5\cdot10^3$; 10^4; $5\cdot10^4$; 10^5; $2\cdot10^5$; $5\cdot10^5$; 10^6r. Results and procedures of the experiments are given.

6369* (Russian.) Behavior of Cast Zirconium Mullite Articles When Heated. **Povedenie plavleno-litykh tsirkonomullitovykh izdelii pri nagrevanii.** A. G. Marants and A. E. Kamenchik. *Steklo i Keramika*, v. 15, no. 1, Jan. 1958, p. 16-18.

Small samples of Zr mullite were sintered at temperatures of 1300, 1400, 1500, 1600, and 1700 C. Heating lasted for 30 to 32 hr. with a 4 hr. soak at the final temperature. Conclusion: taking into account the usual presence of alkalis (0.5-0.5%) the content of all fluxing oxides in Zr mullite articles (TiO_2+ Fe_2O_3+ CaO+MgO+Na_2O+K_2O) should be not more than 4.3 to 4.5%.

6370* (Russian.) The Mechanism of Deterioration of Glass Furnace Brick Lining by the Volatile Components of Borosilicate Glass. **Mekhanizm razrusheniia kladki steklovarennykh pechei letuchimi komponentami borosilikatnogo stekla.** A. A. Zalizniak. *Steklo i Keramika*, v. 15, no. 1, Jan. 1958, p. 19-21.

Discussion of the causes of destruction.

6371* (Russian.) Relation Between Temperature and Viscosity of Silicate Glass. **O temperaturnoi zavisimosti viazkosti silicatnykh stekol.** M. Kh. Karapet'iants. *Steklo i Keramika*, v. 15, no. 1, Jan. 1958, p. 22-25.

Study of the following glasses: $Na_2O\cdot2SiO_2$, $Na_2O\cdot3SiO_2$, $PbO\cdot SiO_2$, and glass compounded of 60% SiO_2, 28.6% PbO, and 11.4% Na_2O.

6372* (Russian.) The Effect of Sudden Cooling of Magnesium Clinker on the Properties of Cement. **Vliianie rezkogo okhlazhdeniia magnezial'nogo klinkera na svoistva tsementa.** S. M. Roiak and V. V. Myshliaega. *Tsement*, v. 23, no. 6, Nov.-Dec. 1957, p. 1-4.

Rapid cooling has a favorable effect on the structure of Mg clinker and cement, decreasing the moisture expansion and slightly increasing the tensile strength.

6373 Factors Controlling Resistance to Deformation and Mechanical Failure in Polycrystalline (Glass-Free) Ceramics. John B. Wachtman, Jr. and Laurel H. Maxwell. *Wright Air Development Center Materials Laboratory, WADC Technical Report* 57-526, Dec. 1957, 67 p. (TL507 Un3.18w Vis.)

The temperature dependence of creep behavior, modulus of rupture, Young's modulus and internal friction were studied to determine the factors controlling resistance to deformation and failure in polycrystalline Al_2O_3, MgO, and other materials. Alumina at 1000 C undergoes very little creep; a maximum tensile strain of about 3×10^{-4} was obtained and more than half of this may be recovered in a few hr. after removal of load. At higher temperatures, there is some indication of increasing plasticity.

See also: **7201** (carbon blast furnace lining); **7445** (properties of graphite).

CHEMICAL ENGINEERING

6374* Formation of Acetylene by Incomplete Combustion of Methane in Oxygen. P. A. Tesner. *British Chemical Engineering*, v. 3, Feb. 1958, p. 72-75.

Results obtained in the U.S.S.R. in studying the process of C_2H_2 formation in a flame. New furnace designs.

6375 Heat Transfer From Column Wall to Bed in Spouted, Fluidized and Packed Systems. J. Klassen and P. E. Gishler. *Canadian Journal of Chemical Engineering*, v. 36, Feb. 1958, p. 12-18.

In the case of spouted beds, the heat transfer coefficent increases sharply at the onset of spouting and passes through a maximum as gas velocity is increased. The maximum heat transfer coefficient is 25 to 75% lower for a spouted bed than for a fluidized bed under similar conditions.

6376 Relative Volatility and Enthalpy Data for the Systems C_4 Hydrocarbons-Acetone-Water Developed From Vapor-Liquid Equilibria. J. E. Ewanchyna and C. Ambridge. *Canadian Journal of Chemical Engineering*, v. 36, Feb. 1958, p. 19-36.

Systems of *n*-butene, isobutane, butene-1, and cis-butene-2 are studied.

6377 Find Distillation Stages Graphically. Paul J. Horvath and Richard F. Schubert. *Chemical Engineering*, v. 65, Feb. 1958, p. 129-132.

A simple, accurate method to find theoretical stages in regions of very low and very high concentrations.

6378 Eastman Process for Cracking Light Hydrocarbons to Acetylene and Ethylene. G. A. Akin, T. F. Reid, and R. J. Schrader. *Chemical Engineering Progress*, v. 54, Jan. 1958, p. 41-48.

Report on 12-month operation of a million lb./yr. pilot plant, using new process which mixes cracking stock with hot combustion products from either fuel gas-O_2 or -air flame.

6379 Water Reservoir Evaporation Control. Russel G. Dressler and Arnold G. Johanson. *Chemical Engineering Progress*, v. 54, Jan. 1958, p. 66-69.

Savings of more than 20 billion gal. of water daily in the U. S. are possible with new monomolecular film techniques for cutting down lake and reservoir evaporation.

6380 Pall Rings—New Type of Tower Packing. John S. Eckert, Earl H. Foote, and Richard L. Huntington. *Chemical Engineering Progress*, v. 54, Jan. 1958, p. 70-75.

Comparative tower packing performance tests of carbon steel Pall rings and Raschig rings of same size indicate improved mass transfer coefficients and reduced pressure drop for Pall rings.

6381* Progress in Absorber and Fractionator Tray Design. *Chemical & Process Engineering*, v. 39, Feb. 1958, p. 41-47.

6382* (German.) The Computation of Fluid-Solid Counterflow Extractions for a Slo-Dissolving Process or in Simultaneous Adsorption Processes. **Berechnung der Gegenstromextraktionen fest/flüssig für langsam verlaufende Lösungsvorgänge oder bei gleichzeitigen Adsorptionsvorgängen.** Erich Sattler-Dornbacher. *Chemie-Ingenieur-Technik*, v. 30, no. 1, Jan. 1958, p. 14-18.

Analyzes fluid-solid counter-flow extractions either by a low rate of dissolution of the extract, or by the adsorption of the extract in the material. Describes graphical and calculation procedures which give better results than current methods.

6383* (French.) The Demineralization of Water. **La déminéralisation de l'eau.** Henri Jacques Bourne. *Chimie & Industrie*, v. 79, no. 1, Jan. 1958, p. 15-22.

Fundamentals of the chemical quality of water; former methods of purification; current techniques based upon synthetic ion-exchange resins. Emphasizes complete demineralization by means of mixed-bed installations, which makes it possible to obtain water with a resistivity as high as 15 to 20 million ohms.

6384* Chemicals in the Manufacture of Synthetic Fibers. A. J. Hall. *Fibres Engineering and Chemistry*, v. 19, Jan. 1958, p. 5-12.

The character and manufacture of the chemicals used.

6385* (Russian.) Preparation of Sulfuric Acid by the Wet Catalysis Method. **Protsess polucheniia sernoi kisloty metodom mokrogo kataliza.** S. A. Dzhobadze and E. Rudinskii. *Gazovaia Promyshlennost'*, 1958, no. 1, Jan., p. 16-19.

Method and equipment used in simultaneous condensation of SO_3 and water vapors. High quality H_2SO_4 (93-94%) is obtained from gases with no more than 6% of H_2S.

6386* (French.) The Rheology of Petroleum Products. **La rhéologie des produits du pétrole.** R. N. J. Saal. *Génie Chimique (Supplement to Chimie & Industrie)*, v. 79, no. 1, Jan. 1958, p. 1-11.

A study of rheology in the case of shearing stress. Elasticity and viscosity of petroleum products in terms of time and temperature. Definite instances of critical flow stress and viscoelasticity. Relationship between rheological properties and density.

6387 Development of a Laboratory-Size, Fluidized Bed Reactor. B. M. Johnson. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-51834, Nov. 1957, 40 p. (UF767 Un3.1hw Contin.)

Equipment design and operating procedure. Effect of oxidation-reduction cycle on sintering properties of various UO_2 powders.

6388 (German.) Effect of the Anions on Ca-Na-Exchange Equilibria in the Case of Cation Exchangers. **Anionenwirkung auf Ca-Na-Gleichgewichte an Kationenaustauschern.** H. Deuel, K. Hutschneker, E. Stutz, and J. C. Frederiks. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2009-2014.

Measuring Ca^{2+}-Na^{+} exchange equilibria between Dowex 50 or cross-linked pectic acid as cation exchangers and external solutions with different anions. Decrease of Ca^{2+} selectivity of the exchangers by anions in the following order: acetate, β-indolyl acetate, and citrate.

6389 Higher Oxo Alcohols. Lewis F. Hatch. 120 p. 1957. John Wiley & Sons, New York. (TP358 H28h)

Reviews the extensive patent literature on the oxo reaction for the production of aldehydes and alcohols from olefins, CO, and H. Utilization of the higher alcohols in plasticizers, agricultural applications, detergents, and lubricants is discussed.

6390 Pyrometallurgical Separation of Uranium From Thorium. Premo Chiotti and H. E. Shoemaker. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 137-140.

Equilibrium phases in the Mg-rich end of the ternary system, Mg-Th-U, were evaluated for separating U from Th. At 1132 C two liquid phases are formed, a Mg-rich liquid containing most of the Th and a U-rich liquid containing 99% or more of U.

6391 Separating Hafnium From Zirconium. Solvent Extraction With Tributyl Phosphate. R. P. Cox, H. C. Peterson, and G. H. Beyer. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 141-143.

Experimental data on purifying aqueous solutions of $Zr(NO_3)4$ by extraction into tributyl phosphate and heptane.

6392 Purifying Thorium Nitrate by Solvent Extraction. D. D. Foley and R. B. Filbert, Jr. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 144.

Tributyl phosphate in a commercial hydrocarbon diluent was used to purify thorium nitrate by a liquid-liquid extraction method. The product was of acceptable purity with high recoveries of both product and reagents. Mass transfer equilibria for a continuous, countercurrent organic-aqueous system were developed, and operable conditions established.

6393 Gamma Radiolysis: Tributyl Phosphate and Its Diluent Systems. L. L. Burger and E. D. McClanahan. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 153-156.

Dibutyl phosphate is the principal product of radiolysis. Monobutyl phosphate, phosphoric acid, butyl alcohol and ether, polymers, and gaseous products consisting of H and hydrocarbons are also produced.

6394 New Ion Exchange Resin for Uranium Recovery. A. H. Greer, A. B. Mindler, and J. P. Termini. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 166-170.

Permutit SK and SKB resins have a U capacity exceeding 70 g. of UO_2 per liter; fast U adsorption rate with a break-through capacity of over 60 bed volumes; fast and complete U elution, especially when using nitrate; and good physical and chemical stability.

6395 Engineering Design of Oak Ridge Fluoride Volatility Pilot Plant. Robert P. Milford. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 187-191.

New facility will demonstrate U recovery from spent Zr-enriched U reactor fuels by volatilization of UF_6 and absorption on NaF.

6396 Industrial Applications of Ion Exchange Resins. R. M. Wheaton and R. E. Anderson. *Journal of Chemical Education*, v. 35, Feb. 1958, p. 59-65.

A review of applications and equipment.

6397* Preparation of Highly Effective Rust Inhibitors by Fractionation of Mahogany Sulfonates. K. R. Fisch, J. Messina, and H. Gisser. *Lubrication Engineering*, v. 14, Feb. 1958, p. 64-67.

Fractionation by continuous extraction of a solution of the sulfonate in 50% isopropyl alcohol with petroleum ether. Equivalent weight and rust preventive effectiveness of the fractions were determined.

6398 Quarterly Periodic Status Report of the Hydrogen Peroxide Laboratories. W. C. Schumb and C. N. Satterfield. *Massachusetts Institute of Technology, Office of Naval Research Contract* Nonr-1841 (11), Dec. 1957, 10 p. (QD181.H1 M38.3q Contin.)

Reports work on corrosion of steel and Al in the presence of H_2O_2, high pressure ignition limits of H_2O_2, heterogeneous catalysis in liquid H_2O_2, and ignition liimts of H_2O_2 solutions at atmospheric pressure.

6399* (French.) Applications of New Fluidization Techniques. **Application des nouvelles techniques de "fluidisation".** *Métallurgie et la Construction Mécanique*, v. 90, no. 1, Jan. 1958, p. 43-44.

Definition of dense fluidization and light fluidization. Advantages of the pseudo-liquid phase achieved by the application of this process. Description of a plant.

6400 How Gasoline Plants Are Using Gas Chromatography. A. J. Miller. *Oil and Gas Journal*, v. 56, Mar. 3, 1958, p. 88-91.

Method enables plant to keep continuous contact for recovery efficiency and observe the effects of even small changes in operating variables, such as weather temperatures.

6401 Aqueous-Amine Acid-Removal Process Needn't Be Corrosive. J. S. Connors. *Oil and Gas Journal*, v. 56, Mar. 3, 1958, p. 100 + 5 pages.

With correct designing, corrosion can be minimized and the use of all carbon-steel equipment permitted.

6402 Perforated Trays Designed This Way. Chen-Jung Huang and John R. Hodson. *Petroleum Refiner*, v. 37, Feb. 1958, p. 103-118.

Step-by-step design procedure, with equations and nomograms.

6403 Applied Hydrocarbon Thermodynamics. II. A Review of P-V-T Data Correlations. Wayne C. Edmister. *Petroleum Refiner*, v. 37, Feb. 1958, p. 123-130.

Equations-of-state; compressibility factors; Boyle temperature; P-V-T plots; mixture P-V-T; partial volumes.

6404 How to Design Static Adsorption Beds. Willis A. Johnston and C. D. Laughlin. *Petroleum Refiner*, v. 37, Feb. 1958, p. 131-134.

Equations for factors involved in the design of beds for decolorization, purification, and finishing of light distillate, lubricating oils, and waxes.

6405* Demineralizing Systems. Robert H. Marks. *Power*, v. 102, Feb. 1958, p. 71-78.

Progress in development of water demineralizing and purification systems for current industrial (atomic power) demands.

6406* *Review of Coal Tar Technology*, v. 9, Jan.-June 1957, 84 p.

A review of the literature on production, purification, properties, and reactions of coal tar and coal tar products, also associated general chemistry and chemical techniques.

6407 (French.) Liquid-Liquid Equilibria at 25°C. **Équilibres liquide-liquide a 25°C.** J. Durandet. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 12, Nov. 1957, p. 1161-1167.

ββ-Oxydipropionitrile-*n*-heptane-toluene and ββ-thiodipropionitrile-*n*-heptane-toluene.

6408 (French.) Liquid-Liquid Equilibrium of Propylene Carbonate-*n*-Heptane-Toluene at 20 C. **Équilibre liquide-liquide a 20°C carbonate de propylène-*n*-heptane-toluène.** Y. L. Gladel and Ph. Lablaude. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 12, no. 12, Dec. 1957, p. 1236-1240.

The selectivity of this solvent for the separation of paraffinic and aromatic hydrocarbons is compared with that of ethylene carbonate.

6409 Surface Active Agents and Detergents. Anthony M. Schwartz, James W. Perry, and Julian Berch. v. II. 839 p. 1958. Interscience Publishers, Inc., New York. (TP149 S95s)

Processes for synthesizing and manufacturing surfactants; special function surfactants and compoistions; physical and chemical properties; practical applications.

6410 (German.) Preparation of Pure Rare Gases at Low Temperatures. **Die Reindarstellung von Edelgasen unter Anwendung tiefer Temperaturen.** G. Gnauck. *Technik*, v. 13, no. 1, Jan. 1958, p. 57-60.

Purification of Ne-He mixtures by means of silica gel at 90 K, and separation of Ne at 62 K. Equipment and methods for preparation of pure Ar.

6411 Longitudinal Dispersion in Solvent-Extraction Columns: Peclet Numbers for Ordered and Random Packings. Gabriel L. Jacques and Theodore Vermeulen. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-8029, Nov. 1957, 152 p. (UF767 U3u Contin.)

Dispersion phenomena in packed beds in both axial and radial directions were studied to provide basic data for extraction-tower design.

See also: **6921** (high capacity P/D meters); **7555** (new techniques in mineral engineering); **7674** (air pollution control in petroleum refineries).

CHEMISTRY—ANALYTICAL

6412* (English.) **The Separation and Estimation of Nucleotides.** Rolf Bergkvist. *Acta Chemica Scandinavica*, v. 11, no. 9, 1957, p. 1465-1472.

Separation of the 5'-mono-, di-, and tri-phosphates of adenosine, guanosine, cytidine and uridine together with uridine diphosphate glucose, uridine diphosphate acetylglucosamine, diphospho- and triphosphopyridine nucleotides.

6413* (German.) Separation of Hydrophobic Substances by Paper Chromatography Using Cellulose Ester Papers. **Papierchromatographische Trennung Hydrophober. Substanzen mit Cellulose-Ester-Papieren.** F. Micheel. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 12, nos. 3-4, 1957, p. 331-345.

Separation of extremely hydrophobic substances applying a method of esterification of the cellulose paper to a larger or smaller extent with different carboxylic acids during which the paper retains its original structure. Details of preparation and applications. The anion and cation exchanger papers proved suitable in certain fields.

6414* (German.) Analysis of Peroxy Compounds. **Beiträge zur Analyse der Peroxyverbindungen. II.** Induction Reactions During Analysis of the System H_2O_2-H_2SO_4. **Die bei der Analyse des Systems H_2O_2-H_2SO_4 auftretenden induzierten Reaktionen.** L. J. Csányi and F. Solymosi. *Acta*

Chimica Academiae Scientiarum Hungaricae, v. 13, nos. 1-2, 1957, p. 19-37.

6415* (German.) Flame Photometric Investigation of Emissions Measured on Molecular Bands. **Flammenphotometrische Untersuchung der auf Molekulbanden gemessenen Emissionen. II.** Investigation of Boric Acid by Flame Photometry. **Flammenphotomerische Untersuchungen der Borsäure.** E. Pungor and I. Konkoly Thege. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 13, nos. 1-2, 1957, p. 39-47.

6416* (German.) Recent Results of Derivative Thermogravimetry. **Neuere Ergebnisse der derivative Thermogravimetrie.** F. Paulik and L. Erdey. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 13, nos. 1-2, 1957, p. 117-140.

Investigations of analytic precipitates, bauxites, alumina hydrates, red silts, cryolites, and catalysts by derivative thermogravimetry.

6417* (English.) **Identification of Titanium Oxides by X-Ray Powder Patterns.** Sten Andersson, et al. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1653-1657.

X-ray powder data for 15 phases in the Ti-O system.

6418* (English.) **A New Volumetric Method for Determination of Tin Beside Antimony.** John V. Villadsen and Knud G. Poulsen. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1671-1676.

The Sb is titrated with bromate, precipitated with thioacetamide, and filtered off with tin in solution as oxalate complexes. After oxalate oxidation, tin is reduced to the stannous state and titrated with bromide in CO_2 atmosphere.

6419 The Determination of Uranium by Solvent Extraction. I. The Separation of Uranium-233 From Irradiated Thorium as the Diethyldithiocarbamate Complex. W. H. Hardwick and M. Moreton-Smith. **II. The Separation of Uranium-233 From Irradiated Thorium as the Oxine Complex in the Presence of Ethylenediaminetetra-Acetic Acid.** R. F. Clayton, W. H. Harwick, M. Moreton-Smith, and R. Todd. *Analyst*, v. 83, Jan. 1958, p. 9-23.

6420 The Molybdate Method for the Determination of Phosphorus, Particularly in Basic Slag and in Steel. D. Stockdale. *Analyst*, v. 83, Jan. 1958, p. 24-36.

6421 Determination of the Major Constituents of Small Amounts of Tissue. John Paul. *Analyst*, v. 83, Jan. 1958, p. 37-42.

A fractionation procedure that permits the determination of lipid, carbohydrate, protein nitrogen, ribonucleic acid and deoxyribonucleic acid in single samples of tissue of about 1 mg. dry weight is described.

6422* Bibliography on Gas Chromatography and Some Related Methods. 68 p. 1956. Consolidated Electrodynamics Corp., Pasadena. (ZQD271 Un3.5b Ref.)

Contains 169 references, some annotated.

6423* (English.) **Spectrophotometric Method for the Determination of Small Amounts of Sulfate Ions.** Iwaji Iwasaki, et al. *Chemical Society of Japan, Bulletin*, v. 30, no. 8, Nov. 1957, p. 847-851.

Determination of 0.3 to 100 p.p.m. sulfate, using $BaCrO_4$ suspended in an acid solution.

6424* (English.) **Analytical Studies of Boron. VI. Determination of Boron Using Ion Exchange Resin.** Satoru Muto. *Chemical Society of Japan, Bulletin*, v. 30, no. 8, Nov. 1957, p. 881-885.

6425 EDTA Titration of Zinc in Brass & Bronze, and of Cobalt in the Presence of Copper. E. Körös and Z. Remport-Horvath. *Chemist-Analyst*, v. 46, Dec. 1957, p. 91-92.

Xylenol Orange is used as indicator .

6426* (Italian.) Improvements in the Analysis of Chlorine-Hydrogen Mixtures and in Particular Technical Grade Chlorine of Electrochemical Plants. **Miglioramenti nell'analisi di miscele cloro-idrogeno ed in particolare del gas cloro tecnico degli impianti elettrochimici.** Giancarlo Perugini. *Chimica e l'Industria*, v. 40, no. 1, Jan. 1958, p. 16-20.

An apparatus was developed which allows sampling and analysis of the gas without exposing it to light, so avoiding photosynthesis of HCl, cause of serious errors. Hydrogen can be determined with a deviation of ± 0.03%; the apparatus is also suitable for the analysis of technical grade chlorine in the presence of Cl_2, $HCl + CO_2$, O_2, CO, H_2, and air.

6427 Differential Thermal Analysis: Theory and Practice. W. J. Smothers and Yao Chiang. 444 p. 1958. Chemical Publishing Co., New York. (TP811 Sm79d)

Covers origins, equipment, theory, and selected applications, of qualitative and quantitative methods. Use and correlation of results. Data is applicable in the fields of chemistry, geology, soil science, ceramics, and metallurgy.

6428 A Test for Solvent Quality. Thomas P. Garrett, Jr. *E. I. duPont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-237, Aug. 1957, 16 p. (UF767 Un3.1dp Contin.)

The degradation products from solvents used in the extraction of U and Pu from irradiated fuel irreversibly complex Zr; the amount of degraded materials in the solvent is determined by equilibration with a Zr tracer solution of known activity and concentration.

6429 A Gamma Absorptometer for the Continuous Analysis of Solutions of Heavy Metal Salts. Donald H. Thurnau. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-249, Nov. 1957, 31 p. (UF767 Un3.1dp Contin.)

Measures the absorption of a γ-ray beam by sample solutions. A dual beam system permits a precision of better than ± 0.5%.

6430 Analysis for Industry. II. T. S. West. *Industrial Chemist*, v. 34, Feb. 1958, p. 89-91.

Applications of the less common complexones.

6431 Methods for the Rapid Determination of Silicon in Ferrosilicon. Sigurd Velken. *Iron and Steel Institute, Journal*, v. 188, Feb. 1958, p. 119-121.

Two volumetric methods based on precipitation of Si as potassium fluosilicate followed by its titration.

6432 The Effect of Nitrides in Silicon Iron on the Determination of Oxygen by Chlorination, and the Possible Direct Determination of Aluminium Nitride. F. J. Armson and H. L. Bennett. *Iron and Steel Institute, Journal*, v. 188, Feb. 1958, p. 132-137.

Iron containing 4% Si and 0.3% Al was analyzed for O by chlorination in a vertical closed reaction chamber. Chlorination affords a potential method for the direct determination of AlN and possibly Si_3N_4.

6433 Gas-Liquid Chromatography. I. Retention-Volume Data of Certain Tar Acids. L. Irvine and T. J. Mitchell. *Journal of Applied Chemistry*, v. 8, Jan. 1958, p. 3-6.

Corrected retention volumes per gram of stationary phase are given for 30 tar acids at 183, 155, and 135 C. Results were obtained from a 4-ft. colmun using Apiezon-L stop-cock grease as stationary phase and Celite-535 as mechanical support. The carrier gas was N and thermal conductivity was used for detection of constituents.

6434 Continuous Analysis. C. D. Lewis. *Journal of Chemical Education*, v. 35, Feb. 1958, p. 87-94.

Analytical instruments used in industrial research; problems in application.

6435* (Hungarian.) Equipment for Rapid Differential Thermal Analysis. **Gyors differenciális termikus elemző készülék.** Maria Vogl Földvári and Béla Kliburszky. *Magyar Kémikusok Lapja*, v. 12, no. 1, Jan. 1957, p. 19-21.

Complete description of equipment with vertical arrangement of elements.

6436* (German.) Determination of Vanadium With 2-Benzoyl-Phenylhydrazine. **Bestimmung von Vanadium mit β-Benzoyl-phenylhydrazin.** A. Musil and W. Haas. *Mikrochimica Acta*, 1957, no. 6, p. 803-808.

A green-yellow color develops with microgram amounts of V. Effects of acids and salts on the complex. Direct determination of V in the presence of other metals.

6437* (German.) Spectroscopic Behavior of Copper Alloys in Externally Ignited Intermittent Arcs. **Das spektroskopische Verhalten von Kupferlegierungen im fremdgezünndeton Abreissbogen.** J. Derkosch and H. Neuinger. *Mikrochimica Acta*, 1957, no. 6, p. 823-836.

New means of eliminating the ignition difficulties in spectrographic analysis of these alloys; significance of the rectifying effect on the electrodes. Sparking-off curves obtained in various discharge-gases.

6438* (German.) Microdetermination of Chlorine and Bromine in Organic Materials. **Mikrobestimmung von Chlor und Brom in organischen Stoffen. XV.** M. Večeřa and J. Bulušek. *Mikrochimica Acta*, 1958, no. 1, p. 41-51.

Combustion of the sample in a quartz tube provided with a quartz frit. The halogen ions were obtained by absorption in H_2O_2.

6439* (English.) **On the Microdetermination of Sulphur in Organic Compounds by the Silver Gauze Method.** Einar Bladh, K. J. Karrman, and Olle Andersson. *Mikrochimica Acta*, 1958, no. 1, p. 60-67.

Systematic sources of errors in the method involving combustion of the S-containing compound in a stream of O and absorption of the S oxides formed on a Ag gauze at 500-700 C with quantitative formation of Ag_2SO_4.

6440* (German.) Contribution to Spectrochemical Trace Analysis. **Beiträge zur Spurenanlyse. I.** Spectrochemical Analysis for Traces in Purest Aluminum and Aluminum Compounds. **Zur Spurenanalyse von Reinstaluminium und Aluminium-verbindungen. II.** Spectrochemical Analysis for Traces in Titanium and Its Compounds. **Zur Spurenanalyse von Titan und Titanverbindungen.** O. G. Koch. *Mikrochimica Acta*, 1958, no. 1, p. 92 + 18 pages.

Quantitative determination of trace elements, according to their spectroanalytical limits of detection in concentrations from 0.00001 to 0.001% and up. A method for the simultaneous determination of the traces of 26 elements containing Ti and its compounds.

6441* (French.) Study of Ion Distribution in an Ion Exchange Column. **Étude de la distribution des ions sur colonnes échangeuses.** Claude Rocchiccioli. *Mikrochimica Acta*, 1958, no .1, p. 124-136.

Distribution of metal ions of various valencies in pure solutions or mixtures, on a cationic resin, by a semi-micro analytical method.

6442 Master Analytical Manual. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, TID-7015, Nov. 1957, sections individually paged. (UF767 Un3ti Contin.)

Spectrographic and nuclear analysis methods covering a wide range of materials.

6443* (Czech.) Analytical Study on the Pyridine Base in Chemicals of Coke Plants. **Příspěvek k analytickému sledování obsahu pyridinových basí v chemických produktech koksoven.** I. Kavan. *Paliva*, v. 37, no. 12, Dec. 1957, p. 416-418.

A quantitative study of the solutions distilled from buffer solution and determined in gas by means of colorimetric method with aniline, water, and BrCN; in other products by titration.

6444 Analyze for Ba, Ca, and Zn This Way. Ralph J. Bertolacini. *Petroleum Refiner*, v. 37, Feb. 1958, p. 147-149.

A rapid and accurate method for determining Ba, Ca, and Zn in lube additives and oils.

6445 Separation of Uranium From Diverse Ions: Study of the Hexone Liquid-Liquid Extraction System. William J. Maeck, Glenn L. Booman, Maxine C. Elliott, and James E. Rein. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14415, Dec. 1957, 22 p. (UF767 Un3.1id Contin.)

The salting agent is 4 ml. of 2.8*M* $Al(NO_3)_3$ made 0.1% in tetrapropylammonium nitrate and 1*M* in NH_4OH. A 0.5-ml. sample aliquot is added to the slating solution and the U is extracted into 2 ml .of methyl isobutyl ketone.

6446* The Quantitative Determination of Rubber Chemicals. Otto Lorenz and Elisabeth Echte. *Rubber Chemistry and Technology*, v. 30, Oct.-Nov. 1957, p. 1017-1026. (Translated from *Kautschuk und Gummi*, v. 9, no. 12, Dec. 1956, p. WT300-WT304.)

Procedures for determining mercaptobenzothiazole, zinc benzothiazolylmercaptide, dibenzothiazolyl disulfide, and their mixtures. Determination of S and Zn salts of the fatty acids in the presence of these compounds.

6447* A Spectrophotometric Method for Residual Styrene in SBR Latex. C. L. Hilton. *Rubber Chemistry and Technology*, v. 30, Oct.-Nov. 1957, p. 1183-1187.

Method is rapid, accurate, and precise. The direct ultra-violet absorption method is applicable only in absence of interferences.

6448 Precision Polarography. Ake Bresle. *Science Tools*, v. 4, Dec. 1957, p. 33-36.

Accuracy limitations in the conventional treatment of a polarogram are discussed.

6449* A Spectrophotometric Method for the Chromatographic Analysis of Sugars. Carl V. Piper and Leo J. Bernardin. *Tappi*, v. 41, Jan. 1958, p. 16-18.

Utilizes a two-stage chromophoric development which eliminates the use of guide strips, minimizes the paper blank, and allows a high degree of accuracy.

6450 An Improved Method of Measuring Uranium Concentration in Uranium-Aluminum Alloy by Gamma Counting. P. F. Haughton, C. R. Fultz, and L. E. Burkhart. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, Y-1176, Jan. 1958, 17 p. (UF767 Un3.1y Contin.)

The entire U-Al slug may be counted, using a larger crystal and multiplier phototube. The U distribution in the individual slugs is discussed.

6451 Determination of the Average Effective Valence State of Titanium in Sodium Chloride. F. R. Cattoir, J. R. Nettle, and D. H. Baker, Jr. *U. S. Bureau of Mines, Report of Investigations* 5372, Nov. 1957, 8 p. (TN21 Un3r)

Analytical methods are presented for determining soluble Ti, total Ti, indicated Ti, and average effective valence in titanium chloride-NaCl mixtures.

6452 X-Ray Emission Spectrographic Analysis of Bastnaesite Rare Earths. Farrel W. Lytle, James I. Botsford, and Henry A. Heller. *U. S. Bureau of Mines, Report of Investigations* 5378, Dec. 1957, 16 p. (TN21 Un3r)

The method includes determination of Yt, Th, La, and the rare-earth elements in complex mixtures. Samples are compared with synthetic standards approximating the composition of the samples.

6453 Volumetric Analysis. v. III. Titration Methods: Oxidation-Reduction Reactions. I. M. Kolthoff, R. Belcher, V. A. Stenger, and G. Matsuyama. 714 p. 1957. Interscience Publishers, New York. (QD111 K83v)

6454* (Polish.) Chromatographic Analysis of Vapors and Gases. **Chromatograficzna analiza par i gazów.** Andrzej Waksmundzki. *Wiadomości Chemiczne*, v. 11, Nov. 1957, p. 617-633.

Applications of division and absorption methods are studied.

6455* (German.) Photometric Semimicro Process for the Determination of Arsenic, Especially in Steel, Iron and Isolation Residues. **Photometrisches Halbmikroverfahren zur Arsenbestimmung, besonders in Stahl, Eisen und Isolierungsrückständen.** U. Bohnstedt and R. Budenz. *Zeitschrift für Analytische Chemie*, v. 159, no. 2, 1957, p. 95-102.

Examinations of pure As solutions; analysis of solid samples. Determination of P and As together. Separation of As and determination in the distillation product. Conditions for reliable staining with addition of formaldehyde.

6456* (German.) Photometric Semimicro Process for the Determination of Sulfur, Especially in Steel, Iron, and Isolation Residues. **Photometrisches Halbmikroverfahren zur Schwefelbestimmung, besonders in Stahl, Eisen und Isolierungsrückständen.** U. Bohnstedt and R. Budenz. *Zeitschrift für Analytische Chemie*, v. 159, no. 2, 1957, p. 102-109.

6457* (German.) Analysis of Nickel Alloys for Oxide Cathodes. **Analyse von Nickellegierungen für Oxydkathoden. V.** Determination of Iron. **Die Bestimmung des Eisens.** K. Riedel. *Zeitschrift für Analytische Chemie*, v. 159, no. 2, 1957, p. 110-112.

Colorimetric determination by extractive isolation of Fe with isobutyl-methyl ketone and photometric evaluation with *o*-phenanthroline in the form of the complex. Advantages of method.

6458* (German.) A New Microweight-Analytical Method for Determination of Beryllium. **Eine neue mikrogewichtsanalytische Bestimmungsmethode für Beryllium.** Th. I. Pirtea and G. Mihail. *Zeitschrift für Analytische Chemie*, v. 159, no. 3, 1958, p. 205-208.

Beryllium is weighed as a complex compound $[Co(NH_3)C][H_2O)_2Be_2(CO_3)_2(OH)_2]\cdot 3H_2O$. The method is simple and can be carried out in 30 to 90 min.

6459* (German.) Masking Uranium(VI) in Complexometric Titration(*p*H10). **Die Maskierung von Uran(VI) bei komplexometrischen Titrationen (p_H10).** E. Lassner and R. Scharf. *Zeitschrift für Analytische Chemie*, v. 159, no. 3, 1958, p. 212-214.

The effectiveness of the H_2O_2 masking of U against ethylenediaminetetraacetate and Erio-chrome. Black is shown on the basis of Mg and Zn titrations.

6460* (English.) **Use of Organic Reagents in Inorganic Analysis. VI. Determination of Thorium and Zirconium With Phenyl Glycine-Ortho and Para-Carboxylic Acids.** Sachindra Kumar Datta. *Zeitschrift für Analytische Chemie*, v. 159, no. 4, 1958, p. 241-249.

Thorium and Zr have been determined gravimetrically almost within the same pH range. A number of foreign ions may be separated from Th and Zr with these reagents.

6461* (English.) **Electrometric Titrations With the Gold Electrode.** H. Khalifa and A. M. Daess. *Zeitschrift für Analytische Chemie*, v. 159, no. 4, 1958, p. 272-277.

Because of the passivity of the oxide formed on its surface, massive Au can be used in place of Pt in electrometric titrations, including acid-base and redox systems.

6462* (English.) **On the Determination of Cerium(IV) by Iodate and Bromate.** M. K. Joshi. *Zeitschrift für Analytische Chemie*, v. 159, no. 4, 1958, p. 283-284.

6463* (English.) **Estimation of Dichlor-Acetaldehyde.** O. P. Malhotra and V. D. Anand. *Zeitschrift für Analytische Chemie*, v. 159, no. 4, 1958, p. 285-287.

Estimated by alkalimetric, argentometric, and iodometric procedure.

6464* (English.) **Electro-Migration on Paper in the Separation of Ions. VIII.** Hari Gopal Mukerjee. *Zeitschrift für Analytische Chemie*, v. 159, no. 4, 1958, p. 287-290.

Osmium is ionophoretically separated from Hg, Cu, Cd, and Bi; UO_2^{++} from Pt, Pd, Bi, and Fe; As and Sb from Pt, Pd, Ru, and Au, with different electrolytic solvents. Tin, however, cannot be separated from Pt group elements.

6465* (English.) **2,4-Hydroxy-5-Chloro-Acetophenone as a Reagent in Inorganic Analysis Colour Reactions With Cations.** Samir K. Banerji and Arun K. Dey. *Zeitschrift für Analytische Chemie*, v. 159, no. 4, 1958, p. 293-294.

A sensitive colorimetric reagent for Fe(III) and U(II) ions. Iron chelate is black while uranyl ion produces a characteristic brown-yellow color in the neutral medium.

6466* (German.) Application of Buffered Complexes of "Merkupral" (Copper Tetraethyl Thiuram Disulfide) in Photometric Analysis of Small Amounts of Mercury in Ores. **Die Verwendung von Merkupral für die photometrische Bestimmung von kleinen Quecksilbermengen in Erzen.** J. Michal, E. Pavlíková, and J. Zýka. *Zeitschrift für Analytische Chemie*, v. 159, no. 5, 1958, p. 321-327.

Offers a rapid, maximum selective and reliable method for determination of Hg in ores. Determination is based on the intense colored complex of Cu with tetraethyl thiuramdisulfide that is decolorized by Hg(II) ions, and their color attenuation that is proportional to the amount of Hg(II) ions occurring in the solution.

6467* (English.) **Chromatographic Study of Anionic Complexes. I. Complex Cuprioxalate.** Eric John Singh and Arun K. Dey. *Zeitschrift für Analytische Chemie*, v. 159, no. 5, 1958, p. 332-334.

Study of the diffusion variation of cuprioxalate complex by the ascending method through a filter paper strip. Investigation of various mixtures of Cu^{2+}:$C_2O_4^{2-}$ ions.

6468* (English.) **Studies in Bivalent Chromium Salts. III. Standardisation of Chromous Sulphate Solution Against Common Oxidising Agents.** J. P. Tandon and R. C. Mehrotra. *Zeitschrift für Analytische Chemie*, v. 159, no. 5, 1958, p. 353-355.

Investigation of the standardization of chromous sulfate by means of $K_2Cr_2O_7$, $Ce(SO_4)_2$, KIO_3, $KBrO_3$, and KIO_4; the end-points are visually determined.

6469* (English.) **Estimation of Uranium. II. A Spectrophotometric Study.** M. Nageswara Rao and S. V. Raghava Rao. *Zeitschrift für Analytische Chemie*, v. 159, no. 5, 1958, p. 356-358.

Properties of complexes of uranium-2-naphthol-1-sulfonic acid. Absorption and Beer's law curves. Interference from related elements. Comparison of the behaviors of the complexing agents R-salt, nitroso-R-salt, and 2-naphthol-1-sulfonic acid.

6470* (German.) Analyses of Phosphorus Compounds. **Untersuchungen über Phosphorverbindungen. XI.** The Raman Spectrum of the $Na_3HP_2O_5\cdot 12H_2O$ Salt. **Das Raman Spectrum des Salzes $Na_3HP_2O_5\cdot 12H_2O$.** M. Baudler. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 292, nos. 5-6, Dec. 1957, p. 325-329.

The Raman spectrum of the melt at 65 C was studied. It differs from that of the sodium pyrophosphite in that it shows a higher frequency within the range of P-H valence oscillations.

6471* (German.) Spectroscopic Examination of Silicon Compounds. **Spektroskopische Untersuchungen an Siliciumverbindungen. II.** Spectroscopic Examination Concerning the S-X-Si Bond in Hexamethyldisiloxane and Its NH-, CH_2-, and S-Analogs. **Spektroskopische Untersuchungen zur Si-X-Si-Brückenbindung im Hexamethyldisiloxan und seinem NH-, CH_2- und S-Analogen.** Heinrich Kriegsmann. *Zeitschrift für Elektrochemie*, v. 61, no. 8, 1957, p. 1088-1094.

See also: **6340** (rapid analysis of silicates); **6341** (analysis of refractories); **6400** (gas chromatography in control of petroleum refining processes); **6484** (UO_3 in orange oxides); **6711** (spectroscopy in protective coatings); **6942** (analysis of coal and coke); **7051** (infra-red spectrophotometry); **7374** (micro-constituents in steels).

CHEMISTRY—INORGANIC AND GENERAL

6472* (English.) **Phase Analysis Studies on the Titanium-Oxygen System.** Sten Andersson, Bengt Collén, Ulf Kuylenstierna, and Arne Magnéli. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1641-1652.

X-ray powder photograph studies of preparations quenched after annealing at various temperatures. The Ti_2O, TiO (low-temp. modification), Ti_4O_7, Ti_5O_9, Ti_6O_{11}, Ti_7O_{13}, Ti_8O_{15}, Ti_9O_{17}, and $Ti_{10}O_{19}$, phases were observed.

6473* (English.) **On Some Properties of Copper and Silver Formates.** F. Kőrösy. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 13, nos. 1-2, 1957, p. 107-109.

The abnormally low paramagnetic momentum of cupric alkanates and their deep blue color may be ascribed to a dative bond between carbonyl oxygen and the cupric ion, bringing the latter into an intermediate state between the cupric and cuprous form and accounting for their easy decomposition in cuprous salts. Crystal structure, and the analogy between the H^+-catalyzed disproportionation of cuprous formate and the formation of higher Ag oxides from Ag_2O and formic acids are discussed.

6474* (English.) **Addition of Hydrogen Sulfide to the Nitrile Group of Arylsulfonylcyanamides by Means of Thiosulfuric Acid.** Z. Földi, and A. Földi. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 13, nos. 1-2, 1957, p. 111-116.

A new reaction in which an addition of free thio-sulfuric acid to the CN group of arylsulfonyl cyanamides takes place, and arylsulfonyl thioureas form in fair yields. Properties of acetylsulfanilyl and sulfanilyl-cyanamide. A reaction mechanism.

6475 The Photochemical Decomposition of the Halides of Tris-(Ethylenediamine)-Cobalt(III) in the Solid State. Donald Klein, Carl W. Moeller, and Roland Ward. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 265-269.

6476* (English.) **Polarographic Studies of Metallic Complexes. I. Oxalato-Ammine, Glycinato-Ammine and Ethylenediamine-Ammine Series of Cobalt(III) Complexes.** Nobufumi Maki, Yoichi Shimura, and Ryutaro Tsuchida. *Chemical Society of Japan, Bulletin*, v. 30, no. 8, Nov. 1957, p. 909-912.

6477 The Relative Affinities of Co-Ordinating Atoms for Silver Ion. I. Oxygen, Sulphur, and Selenium. II. Nitrogen, Phosphorus, and Arsenic. Sten Ahrland, J. Chatt, N. R. Davies, and A. A. Williams. *Chemical Society, Journal*, 1958, Jan., p. 264-288.

6478* (French.) Syntheses of Nitrosochlorides Without the Use of Nitrosyl Chloride. **Synthèses de nitrosochlorures sans l'intervention du chlorure de nitrosyle.** Roger Perrot, Pierre Wodey, and Ginette Baudry. *Comptes Rendus*, v. 246, no. 4, Jan. 27, 1958, p. 617-619.

Alkoxylated derivatives obtained by the action of alcohols on nitrosochloride of diphenyl-1,1 ethylene were changed back into nitrosochloride by means of hydrochloric acid in an ethereal medium.

6479* (Russian.) The Problem of Preparation of a Trivalent Neptunium. **K voprosu o poluchenii trekhvalentnogo neptuniia.** A. D. Gelman and M. P. Mefodeva. *Doklady Akademii Nauk SSSR*, v. 117, no. 2, Nov. 11, 1957, p. 225-226.

Valence of Np was determined by spectro-photometry.

6480 The Solubilities of Some Inorganic Halides. M. F. C. Ladd and W. H. Lee. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 34-39.

The free energies of solution ΔG_s were calculated, for 47 monovalent and divalent metal halides, in water. ΔG_s is found to give a good indication of the solubility, and its variation, among halides of a particular metal.

6481 Influence of Fluorine Substitution on the Properties of Metal Chelate Compounds. II. Copper(II) Chelates of Tetradentate Ligands. A. E. Martell, R. Linn Belford, and M. Calvin. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 3, 1958, p. 170-181.

6482 Some New Trimeric Phosphoronitridic Dihalides. Rip G. Rice, L. W. Daasch, J. R. Holden, and E. J. Kohn. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 3, 1958, p. 190-200.

Synthesis of $P_3N_3Cl_5Br$, $P_3N_3Cl_4Br_2$, and $P_3N_3Cl_2Br_4$ by the reaction of Br-containing P halides with NH_4Br and NH_4Cl.

6483 Some Properties of Boron Trifluoride Dideuterate, D_2O [$BF_3 \cdot OD$]; the Viscosity of Isotopic Pairs of Liquids, and the Mechanism of Electrical Conduction in Molten Complexes. N. N. Greenwood. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 3, 1958, p. 229-236.

Melting point, density, viscosity, and electrical conductivity are compared with those of the dihydrate and the corresponding monohydrate and monodeuterate. Results suggest that conduction occurs by ionic migration.

6484 The Reflectivity of Orange Oxides. B. A. Swinehart. *Mallinckrodt Chemical Works (U. S. Atomic Energy Commission)*, MCW-1405, Nov. 1957, 27 p. (UF767 Un3.1mc Contin.)

Reflectivity measurements were used to qualitatively identify type III UO_3, type II UO_3, $UO_3 \cdot H_2O$, and amorphous UO_3. A method was devised for the quantitative estimation of amorphous UO_3 in an orange oxide.

6485 The Oxidation of Mercury by Nitric Acid. R. F. Murray and H. Schneider. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO,14423, Nov. 1957, 24 p. (UF767 Un3.1id Contin.)

An empirical rate law, oxidation rates, and Hg species in solution have been determined. A reaction mechanism based on the presence of nitrous acid can be interpreted in terms of the rate expression derived.

6486* Inorganic Stereochemistry. R. J. Gillespie and R. S. Nyholm. *Quarterly Reviews*, v. 11, no. 4, 1957, p. 339-380.

A review of theories explaining the stereochemistry of inorganic molecules.

6487* Studies in the Radiolysis of Ferrous Sulfate Solutions. III. Air-Free Solutions at Higher pH. Walter G. Rothschild and A. O. Allen. *Radiation Research*, v. 8, Feb. 1958, p. 101-109.

Radiation oxidation of air-free ferrous sulfate solutions was studied at pH levels up to 2.1, and the results explained in terms of competitive reactions of H and OH for the various solute species present.

6488* (German.) The Chemistry of Carbonyl Complexes of Cobalt. **Zur Chemie der Carbonylkomplexe des Kobalts. IV.** The Problems of the Binding and Oxidation Numbers of Cobalt Nitrosyl Carbonyl. **Über Bindungs- und Oxydationszahlprobleme des Kobaltnitrosylcarbonyls.** G. Bor and B. Mohai. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 293, nos. 1-2, Dec. 1957, p. 84-90.

On the basis of the stoichiometry of formation reactions, as well as of some physical properties, it was proved that the volatile $Co(CO)_3NO$ is a true carbonyl-type compound in which the central metal atom has the oxidation number zero.

6489* (German.) The Determination of an Intermediate Structure Occurring During the Separation of Mg-Al Spinel Supersaturated With Al_2O_3. **Die Bestimmung einer bei der Entmischung Al_2O_3-übersättigter Mg-Al-Spinelle auftretenden Zwischenstruktur.** H. Jagodzinski. *Zeitschrift für Kristallographie*, v. 109, nos. 4-6, Dec. 1957, p. 388-409.

During precipitation of Mg-Al spinels supersaturated with Al_2O_3, a new monoclinic structure was found with a chemical composition very near to pure Al_2O_3.

6490 Zinc Oxide Rediscovered. Harvey E. Brown. 99 p. 1957. New Jersey Zinc Co., New York. (TP245.Z7 N42z Over.)

An up-to-date and comprehensive account of technical properties and applications.

CHEMISTRY—ORGANIC

6491* (English.) **3-Hydroxypicolinaldehyde.** Niels Elming. *Acta Chemica Scandinavica*, v. 11, no. 9, 1957, p. 1496-1498.

Hydrolysis of 3-hydroxypicolinaldehyde triacetate, obtained by rearrangement of 2-hydroxymethyl-3-pyridinol-1-oxide, gave pure 3-hydroxypicolinaldehyde. Derivatives were prepared.

6492* (English.) **N-Substituted Alkyltriaminosilanes. I. On the Reaction of *n*-Propyltrichlorosilane With Primary and Secondary Amines.** Lewi Tansjö. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1613-1621.

Influence of steric and electric properties of the amines on the reaction. Preparation of 30 new compounds.

6493* (English.) **Bifunctional Amines and Ammonium Compounds. VI. Further Homologs and Analogs of bis-Choline Ether Salts.** Jørgen Fakstorp and Jytte Christiansen. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1698-1705.

Many new compounds are reported.

6494* (English.) **Isomerisation of ω-Dimethylaminoethyl-Diethyl-Thionophosphate.** L.-E. Tammelin. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1738-1744.

Isomerization of the thiono compound was shown to yield S, ω-dimethylaminoethyl-diethyl-thiolophosphate.

6495* (English.) **The Preparation of 6-Chloro-*ortho*cresol and 4,6-Dichloro-*ortho*cresol and the Corresponding *Ortho*toloxyacetic Acids.** Sven Nord and Bertil Sjöberg. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1752-1756.

6496* (English.) **Synthetic Confirmation of the Mechanism of N⇌O Acyl Migrations. Preparation and Rearrangement of the Intermediate 2,5-Diphenyl-3,4-dimethyl-μ-hydroxy-1,3-oxazolidine.** K. Koczka and G. Fodor. *Acta Chimica*

Academiae Scientiarum Hungaricae, v. 13, nos. 1-2, 1957, p. 83-88.

The Mg salt of (±)threo-2-hydroxy-2,5-diphenyl-3,4-dimethyl oxazolidine was synthesized by addition of phenylmagnesium bromide to (±)trans-2-oxo-3,4-dimethyl-5-phenyl oxazolidine. This signifies a synthetic approach to the structure of the intermediates in acyl migrations N⇌O since this product rearranges from the intermediate.

6497* (English.) **The Stereochemical Course of the Conversion of 2-Ureido Alcohols Into Oxazolidines. II. Rearrangement of N-Thioureido Alcohols.** K. Koczka and G. Fodor. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 13, nos. 1-2, 1957, p. 89-98.

The stereochemical course of the conversion of N-thiocarbamyl-2-amino alcohols, particularly that of O-benzoyl-N-thiocarbamyl-ephedrine into thiazolidone-2-imides involving inversion, was proved in two ways which brought about correlation of the configuration of the thiazolidone with ψ-ephedrine.

6498 Condensation Products of Cyclic 1,2-Diketones With Benzylidene-bis-Piperidine and Their Spectral Properties. Nelson J. Leonard, John C. Little, and A. Jerry Kresge. *American Chemical Society, Journal*, v. 79, Dec. 20, 1957, p. 6436-6442.

Products formed in the condensation of 1,2-cycloalkanediones (7-, 9-, 10-, 11-, 12-, 13- and 14-membered rings) with benzylidene-bis-piperidine are studied.

6499 Reduction of the Products of Periodate Oxidation of Carbohydrates. V. The Constitution of Cellulose. Irwin J. Goldstein, J. K. Hamilton, R. Montgomery, and F. Smith. *American Chemical Society, Journal*, v. 79, Dec. 20, 1957 p. 6469-6473.

The polyaldehyde formed was reduced with sodium borohydride to the corresponding polyalcohol.

6500 Rates, Products and Salt Effects in the Reactions of 2,4-Dinitrochlorobenzene With Amines in Chloroform and in Ethanol. Sidney D. Ross and Manuel Finkelstein. *American Chemical Society, Journal*, v. 79, Dec. 20, 1957, p. 6547-6554.

The rates of reaction with *n*-butylamine, 2-phenylethylamine and di-*n*-butylamine in chloroform and with *n*-butylamine, piperidine, di-*n*-butylamine and pyridine in ethanol were measured.

6501 Peroxides. V. Kinetics and Products of Decomposition of Perlauric Acid. Winfred E. Parker, Lee P. Witnauer, and Daniel Swern. **VII. The Thermal Decomposition of Primary Hydroperoxides.** Charles F. Wurster, Jr., Lois J. Durham, and Harry S. Mosher. **VIII. The Mechanism for the Thermal Decomposition of *n*-Butyl Hydroperoxide and *n*-Butyl 1-Hydroxybutyl Peroxide.** Lois J. Durham, Charles F. Wurster, Jr., and Harry S. Mosher. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 323-337.

6502 Rates of Solvolysis of *m*-Alkylbenzhydryl Chlorides. Ernst Berliner and Mabel M. Chen. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 343-347.

The order in which the alkyl groups enhance the rate is attributed to C-H hyperconjugation from the *m*-position.

6503 Amine Oxides. V. Olefins From N,N-Dimethylmenthylamine and N,N-Dimethylneomenthylamine Oxides. Arthur C. Cope and Edward M. Acton. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 355-359.

6504 The Synthesis of 3-Substituted Furans. Hans Wynberg. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 364-366.

Starting with the commercially available 1,2,4-trihydroxybutane, a new route to 3-substituted furans via 3-ketotetrahydrofurans was investigated. Synthesis of the unknown 3-phenylfuran is reported.

6505 Lithium Cleavages of Some Heterocycles in Tetrahydrofuran. II. Henry Gilman and Joseph J. Dietrich. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 380-383.

6506 The Chemistry and Partial Structure of Bottromycin. IV. J. M. Waisvisz and M. G. Van Der Hoeven. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 383-385.

The antibiotic bottromycin yields upon mild alkaline hydrolysis a crystalline compound which is biologically inactive, but it can be reactivated by esterification.

6507 Synthesis of Potential Anticancer Agents. XI. $N^{3,6}$-Alkyl Derivatives of 2,6-Diaminopurine. John A. Montgomery and Lee B. Holum. **XII. 9-Alkyl-6-Substituted-Purines.** John A. Montgomery and Carroll Temple, Jr. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 404-411.

6508 Pteridines. XVI. A Synthesis of 2-Aminopyrazine-3-carboxamides by Reductive Ring Cleavage of 3-Hydroxy-1-pyrazolo[b]pyrazines. E. C. Taylor, J. W. Barton, and T. S. Osdene. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 421-427.

6509 Unsaturated Aromatic Amines; a Novel Synthesis of Indoles. John E. Hyre and Alfred R. Bader. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 437-439.

Preparations of N-allyl-, N-crotyl- and N-pentenylaniline are described. N-Crotylaniline reacts with polyphosphoric acid to yield 2,3-dimethylindole and a 2,3-dimethylindoline.

6510 The Configurational Correlation of Optically Active Biphenyls With Centrally Asymmetric Compounds. The Absolute Configuration of 6,6'-Dinitro-2,2'-diphenic Acid. Paul Newman, Philip Rutkin, and Kurt Mislow. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 465-473.

6511 Stereochemistry of the 1,2,3,4-Dibenz-1,3-cycloöctadiene System. Leo V. Dvorken, R. Bruce Smyth, and Kurt Mislow. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 486-492.

The diastereomeric 1,2,3,4-dibenz-1,3-cycloöctadiene-6,7-dicarboxylic acids (α- and β-forms) have been prepared, resolved and identified as *trans* and *cis* stereomers by the fact that the enantiomeric forms of the former mutarotate while those of the latter racemize.

6512 The Thermal Decomposition of Methyl Cyclobutyl Ketone. Louis G. Daignault and W. D. Walters. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 541-545.

During the initial stages of the reaction between 360 and 410 C ethylene and methyl vinyl ketone were present in essentially equivalent amounts. No appreciable inhibition by propylene, toluene, or nitric oxide was observed.

6513 Quantitative Relationship Between Structure and Reactivity for the Reactions Between Diphenyldiazomethanes and Benzoic Acids in Toluene at 25°. C. Kinney Hancock and John S. Westmoreland. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 545-548.

Rate constants were determined for the reaction of diphenyldiazomethane with twelve *m*- or *p*-substituted benzoic acids in toluene, also for 21 reactions of these acids with *m*- and/or *p*-substituted diphenyldiazomethanes in toluene.

6514 Amidines of Certain Substituted Triphenylethylenes. Robert E. Allen, Edward L. Schumann, William C. Day, and M. G. Van Campen, Jr. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 591-598.

Certain bromo substituted triphenylethylenes were converted *via* cyano- and ethyl imidate hydrochloride derivatives to the corresponding guanyl (amidino) substituted triphenylethylenes. Unsubstituted amidines, N-alkyl-, N,N-dialkyl- and N,N'-dialkylamidines were prepared and the amidine group was incorporated into heterocyclic substituents.

6515 A New Synthesis of Unsaturated Acids. I. α,β-Acetylenic Acids. II. α,β-Olefinic Acids. Louis A. Carpino. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 599-604.

Synthesis of α,β-acetylenic acids involves conversion of a β-keto ester (or alternatively an α,β-olefinic acid) followed by halogenation and treatment of the resultant 4,4-dihalopyrazolone with dilute aqueous alkali.

6516 The Addition of Silyllithium Compounds Containing Methyl and Phenyl Groups to Benzophenone in Tetrahydrofuran. Henry Gilman and Glen D. Lichtenwalter. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 607-608.

Reaction of triphenylsilyllithium, methyldiphenylsilyllithium, or dimethylphenylsilyllithium with benzophenone in tetrahydrofuran yields a product with a Si-O bond.

6517 Cleavage of Symmetrically Substituted Disilanes by Lithium in Tetrahydrofuran. Henry Gilman and Glen D. Lichtenwalter. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 608-611.

6518 The Preparation of Cyclohexyltriphenylsilane. Henry Gilman and David H. Miles. *American Chemical Society, Journal,* v. 80, Feb. 5, 1958, p. 611-613.

Two successful preparations used were the reaction of cyclohexyllithium with chlorotriphenylsilane, and that of phenyllithium with trichlorocyclohexylsilane.

6519 Organoboron Compounds. IX. Preparation and Properties of Diisobutyl-*t*-butylborane. G. F. Hennion, P. A. McCusker, and A. J. Rutkowski. *American Chemical Society, Journal,* v. 80, Feb. 5, 1958, p. 617-619.

6520 Elimination Reactions of Bicyclic Quaternary Salts. III. γ-Tropolone From Some Appropriately Substituted Tropanes. J. Meinwald and O. L. Chapman. *American Chemical Society, Journal,* v. 80, Feb. 5, 1958, p. 633-634.

6521 Chemical Reductions of Substituted Cyclohexanones. K. D. Hardy and R. J. Wicker. *American Chemical Society, Journal,* v. 80, Feb. 5, 1958, p. 640-642.

Substituted cyclohexanones were chemically reduced with four different reagents and the stereoisomeric composition of the products determined.

6522 Condensation of Benzene With Unsaturated Chlorides. Louis Schmerling, J. P. West, and R. W. Welch. *American Chemical Society, Journal,* v. 80, Feb. 5, 1958, p. 576-579.

Results of experiments with mono- and dichloroölefins in the presence of H_2SO_4 or of $AlCl_3$ as such or in nitromethane solution. Effect of carrying out $AlCl_3$-catalyzed reactions in the presence of saturated hydrocarbons containing a tertiary C atom.

6523 Periodate-Permanganate Oxidations for Determining Location and Amount of Unsaturation in Monounsaturated Fatty Acids. E. P. Jones and J. A. Stolp. *American Oil Chemists' Society, Journal,* v. 35, Feb. 1958, p. 71-76.

Method shows position of minor unsaturation within about 1%.

6524 Further Studies on the Isomerization of Polyunsaturated Fatty Acids by Potassium Tertiary Butoxide. B. S. Sreenivasan and J. B. Brown. *American Oil Chemists' Society, Journal,* v. 35, Feb. 1958, p. 89-93.

Study revealed that the best conditions for isomerization and estimation of polyunsaturated acids are heating in a sealed tube for 2 hrs. at 140 C with potassium-*t*-butoxide in *t*-butanol.

6525 The Preparation and Infrared Spectra of Morpholides of Ricinoleic Acid and Some of Its Derivatives. Harold P. DuPuy, Robert T. O'Connor, and Leo A. Goldblatt. *American Oil Chemists' Society, Journal,* v. 35, Feb. 1958, p. 99-102.

6526* (German.) The Common Effect of Elementary Sulfur and Gaseous Ammonia on Ketones. **Über die gemeinsame Einwirkung von elementarem Schwefel und gasförmigen Ammoniak auf Ketone. IX.** The Common Effect of Sulfur and Ammonia on Methyl Isopropylketone. **Die gemeinsame Einwirkung von Schwefel und Ammoniak auf Methyl-isopropylketon.** Max Thiel, Friedrich Asinger, and Gerhard Reckling. *Annalen der Chemie,* v. 611, nos. 1-3, 1958, p. 131-138.

Sulfur and NH_3 react with methyl isopropylketone in boiling benzene solution to 2-methyl-2,5-diisopropylthiazoline-Δ^3 and 2,4,5,5-tetramethyl-2-isopropylthiazoline-Δ^3, which can be separated with picric acid.

6527* (French.) Syntheses From Oximinoketones. **Synthèses a partir des oximinocétones.** Suzanne Samné. *Annales de Chimie (Paris),* v. 2, nos. 9-10, Sept.-Oct. 1957, p. 629-681.

The following preparations were obtained: alkyl-glyoxals by oximinoketone hydrolysis; α-amino-alcohols with a primary amino and secondary alcohol function by hydrogenation; oximino alcohols with a tertiary alcohol and primary amino function; primary α-diamines; oximinoglycols from oximino β-diketone.

6528* (French.) A Contribution to the Study of Reactions Having a Heterogeneous-Homogeneous Mechanism. **Contribution a l'étude de réactions a mécanisme hétérogène-homogène.** Gérard Rottner. *Annales de Chimie (Paris),* v. 2, nos. 9-10, Sept.-Oct. 1957, p. 730-756.

Following up Bogoiavlenskaia's and Kolaskii's investigations, a qualitative study was made of the reaction $3CO + SO_2 = 2CO_2 + COS$. The experimental conditions, possibilities, and limitations of the method were shown.

6529* (English.) **The Amorphous X-Ray Diffractogram of Hyaluronic Acid.** Torvard C. Laurent. *Arkiv för Kemi,* v. 11, no. 6, 1957, p. 513-518.

A one-dimensional Fourier analysis of the amorphous X-ray diffractogram of hyaluronic acid reveals main peaks at 1.3 to 1.5 Å, corresponding to the C-C and C-O distances.

6530* (English.) **On the Thiophene Analogues of Mandelic Acid.** Salo Gronowitz. *Arkiv för Kemi,* v. 11, no. 6, 1957, p. 519-526.

New methods for the synthesis of 2- and 3-thienylglycolic acid.

6531 Synthesis of Guanidine From Urea, Ammonium Benzenesulphonate, and Ammonium Sulphamate. Jean L. Boivin and Meude Tremblay. *Canadian Journal of Chemistry,* v. 36, Feb. 1958, p. 378-382.

Guanidine benzenefsulfonate was obtained in yields exceeding 70% by heating urea, ammonium sulfamate, and ammonium benzenesulfonate in respective molar ratios of 1:1:0.75. Effects of temperature, proportion of reactants, and reaction time were studied.

6532* (English.) **Polyterpenes. I. Permanganate Oxidation of Thujopsene.** I. Saburo Akiyoshi and Shizuo Nagahama. *Chemical Society of Japan, Bulletin,* v. 30, no. 8, Nov. 1957, p. 886-889.

Some of the degradation products from oxidation of thujopsene in acetone solution.

6533* (English.) **A New Synthesis of Threonine.** Mikio Sato, Kenji Okawa, and Shiro Akabori. *Chemical Society of Japan, Bulletin,* v. 30, no. 9, Dec. 1957, p. 937-938.

Synthesis from acetaldehyde and Cu glycinate.

6534* (English.) **Chemical Constitution of Renieratene.** Masaru Yamaguchi. *Chemical Society of Japan, Bulletin,* v. 30, no. 9, Dec. 1957, p. 979-983.

6535 The Synthesis and Structure of Some Pyrroloindoles. D. A. Kinsley and S. G. P. Plant. *Chemical Society, Journal,* 1958, Jan., p. 1-7.

Benzoin was condensed with *p*-phenylenediamine to give a mixture containing two tetraphenylpyrroloindoles, the structures of which were determined.

6536 The Kinetics and Mechanisms of Addition to Olefinic Substances. V. Products of the Reaction Between Bromine Chloride and Propene in Water. P. B. D. de la Mare and S. Galandauer. *Chemical Society, Journal,* 1958, Jan., p. 36-43.

6537 The Oxidation of Aromatic Amines. VI. Persulphate Oxidation of Some Carcinogenic Aromatic Amines. Peter Sims. *Chemical Society, Journal,* 1958, Jan., p. 44-47.

The action of alkaline persulfate on a number of aromatic amines gives the sulfuric esters of the corresponding *o*-aminophenols, which yield the free *o*-aminophenols on acid-hydrolysis.

6538 Quinoxalines and Related Compounds. IV. The Fine Structure of the 2- and 3-Hydroxyquinoxalines and 2-Amino- and 2-Mercapto-quinoxaline. G. W. H. Cheeseman. *Chemical Society, Journal,* 1958, Jan., p. 108-113.

Ultra-violet absorption and ionisation properties are presented.

6539 Amine Compounds of the Transition Metals. III. The Reaction of Some Transition-Metal Chlorides With Anhydrous Ethylenediamine and Propylenediamine. G. W. A. Fowles and W. R. McGregor. *Chemical Society, Journal,* 1958, Jan., p. 136-140.

6540 The Reaction Between Aroylacetones and Arylhydrazines. I. L. Finar and Alma B. Simmonds. *Chemical Society, Journal,* 1958, Jan., p. 200-204.

6541 Aminoalkyl Tertiary Carbinols and Derived Products. VI. The Stereochemistry of Some 1-Phenyl-1-2'-pyridylprop-1-enes, and of Some 3-(Tertiary amino)-1-phenyl-1-2'-pyridylprop-1-enes Carrying Additional Substituents. D. W. Adamson, P. A. Barrett, J. W. Billinghurst, and T. S. G. Jones. **VII. A New Synthesis of 1-Arylpyrrocolines.** P. A. Barrett. **VIII. Some 1-Alkyl- and 1:2-*cyclo*-Alkano-pyrrocolines.** P. A. Barrett and K. A. Chambers. *Chemical Society, Journal,* 1958, Jan., p. 312-349.

6542 Actinomycin. VI. The Structure and Synthesis of Actinomycinol. W. G. Hanger, W. C. Howell, and A. W. Johnson. *Chemical Society, Journal,* 1958, Jan., p. 496-504.

Actinomycinol, a degradation product of actinomycin, is shown to be 2:5-dihydroxy-3:6-dimethylacridone - 1:4 - quinone. The structure was confirmed by synthesis.

6543* (German.) The Different Behavior of 2,4-Dichloroanisole and 2,4-Dichlorophenol During Condensation With Aldehydes. **Über das unterschiedliche Verhalten von 2,4-Dichlor-anisol und 2.4-Dichlor-phenol bei der Kondensation mit Aldehyden.** Randolph Riemschneider and Walther Cohnen. *Chemische Berichte,* v. 90, no. 12, 1957, p. 2720-2727.

2,4-Dichloroanisole, in contrast to 2,4-dichlorophenol, in the presence of acid condensation substances is condensed with formaldehyde and chloral to the methoxy group not only in the *o*-position but also in the *m*-position.

6544* (German.) 2,5-Disubstituted Hydroquinone, Hydroxyhydroquinone, and Benzoquinone. **Über 2.5-disubstituierte Hydrochinone, Hydroxyhydrochinone und Benzochinone.** Emil Buchta and Hermann Egger. *Chemische Berichte,* v. 90, no. 12, 1957, p. 2748-2759.

6545* (German.) Intermediate Rings. **Mittlere Ringe. XIV.** Preparation and Cyclization of ω-[Naphthyl-(2)]-Fatty Acids. **Darstellung und Cyclisierung der ω-[Naphthyl-(2)]-fettsäuren.** Rolf Huisgen and Ulrich Rietz. *Chemische Berichte,* v. 90, no. 12, 1957, p. 2768-2784.

6546* (German.) Silicons. **Über Silikone. XL.** Synthesis of Silicon-Organic Compounds From Chloroform. **Die Synthese siliciumorganischer Verbindungen aus Chloroform.** Richard Müller and Günther Seitz. *Chemische Berichte,* v. 91, no. 1, 1958, p. 22-27.

Beside the inorganic chlorosilanes $SiHCl_3$, $SiCl_4$, and Si_2Cl_6, disilyl methane chlorine derivatives and trisilyl methanes were obtained by reaction of Si with chloroform.

6547* (German.) Phosphorus Organic Compounds. **Phosphororganische Verbindungen. VIII.** Quarternary Aryl Phosphonium Salts by the "Diazo Method". **Quartäre Arylphosphoniumsalze nach der "Diazomethode". IX.** Quarternary Aryl Phosphonium Salts by the "Cobalt Salt Method". **Quartäre Arylphosphoniumsalze nach der "Kobaltsalz-Methode".** Leopold Horner and Hellmut Hoffmann. **X.** Cleavage Process of Mixed Substituted Tetraaryl Phosphonium Hydroxides. **Zum Spaltungsverlauf gemischt substituierter Tetraaryl - phosphonium - hydroxyde.** Leopold Horner, Hellmut Hoffman, Hans G. Wippel, and Günther Hassel. **XI.** Verifying the Structure of the "Schönberg-Adduct". **Strukturbeweis des "Schönberg-Adduktes".** Hellmut Hoffmann, Leopold Horner, and Günther Hassel. **XII.** Phosphine Oxides as Olefin-Forming Reagents. **Phosphinoxyde als Olefinierungsreagenzien. XIII.** Production of Phosphine Acids and Phosphine Oxides. **Darstellung von Phosphinsäuren aus Phosphinoxyden.** Leopold Horner, Hellmut Hoffmann, and Hans G. Wippel. **XIV.** Adducts From Tertiary Phosphines and Carbonium Salts. **Addukte aus tertiären Phosphinen und Carboniumsalzen.** Leopold Horner and Burkhard Nippe. *Chemische Berichte,* v. 91, no. 1, 1958, p. 45-75.

6548* (German.) Heterocyclic Compounds. **Heterocyclische Verbindungen. II.** Highly Condensed Quinoxaline. **Über höherkondensierte Chinoxaline. III.** Highly Condensed Flavazoles. **Über höherkondensierte Flavazole.** Günter Henseke and Waltraut Lemke. *Chemische Berichte,* v. 91, no. 1, 1958, p. 101-122.

6549* (German.) Ring Reactions With Thiosemicarbazides. **Ringschlussreaktionen mit Thiosemicarbaziden.** Günter Losse, Willi Hessler, and Alfred Barth. *Chemische Berichte,* v. 91, no. 1, 1958, p. 150-157.

Heterocyclic seven-membered-rings, 5-mercapto-1,2,4-triazoles, bispyrazolones, and pyrazol-thiocarboxylic acid - (1) - amides were obtained from the reaction of β-keto-carboxylic acid esters and β-dicarbonyl compounds with thiosemicarbazide and 2-substituted thiosemicarbazides.

6550* (German.) Polycyclic Compounds. **Polycyclische Verbindungen. V.** Syntheses of Terylene. **Synthesen des Terrylens.** Emil Buchta, Heinz Vates, and Hans Knopp. *Chemische Berichte,* v. 91, no. 1, 1958, p. 228-241.

1,2-Di-α-naphthyl-naphthalene, obtained from decalindione(1, 5) and α-naphthyllithium, formed terylene in the aluminum chloride-sodium chloride melt. Two other syntheses from derivatives of 1,4-di-α-naphthyl-naphthalene.

6551 Chemistry of Hexachlorocyclo-Pentadiene. C. W. Roberts. *Chemistry & Industry,* 1958, no. 5, Feb. 1, p. 110-115.

A summary of pertinent data from recent literature.

6552* (French.) The Mechanism of Oxidation of Simple Hydrocarbons. **Mécanisme de l'oxydation des hydrocarbures simples.** N. N. Semenov. *Chimie & Industrie,* v. 79, no. 1, Jan. 1958, p. 3-10.

At low temperatures, photochemical reactions give hydroperoxides. These give aldehydes when the temperature rises. When higher hydrocarbons are oxidized, hydroperoxide radicals may be isomerized in two different ways, giving numerous intermediates.

6553* (German.) Organo-Silicon Compounds. **Organosilicium-verbindungen. XIV.** Inhibition of Direct Synthesis of Methyl Chloro-Silanes by Nitric Oxide. **Die Inhibierung der Direkten Synthese der Methylchlorsilane durch Stickstoffmonoxyd.** K. Setínek, V. Bažant, and F. Šorm. *Collection of Czechoslovak Chemical Communications,* v. 22, no. 6, Dec. 1957, p. 1822-1826.

Confirms that the course of the reaction goes through the radicals. Mechanism of formation of silicon-free products was also discussed.

6554* (French.) Syntheses in the Gemdimethyl-1 Octalin-9 Series. **Synthèses dans la série de la gemdiméthyl-1 octaline-9.** Max Mousseron and Magdeleine Mousseron-Canet. *Comptes Rendus,* v. 245, no. 25, Dec. 16, 1957, p. 2156-2160.

Ring formation reactions were produced in one of the acids derived from the condensation of myrcene and acrylic acid. Study of formation and structure by infra-red spectrography.

6555* (French.) Preparation of the Carbamates of Silver and Copper. **Préparation des carbamates d'argent et de cuivre. II.** Maurice Bernard. *Comptes Rendus,* v. 246, no. 1, Jan. 6, 1958, p. 120-123.

The carbamates were prepared by double decomposition in liquid ammonia between ammonium carbamate and Ag or Cu nitrates. The carbamates insoluble in ammonia precipitated out.

6556* (French.) Production and Reduction of a New Anthracene Photopolymer. **Obtention et réduction d'un nouveau photopolymère anthracénique.** Raymond Calas and Robert Lalande. *Comptes Rendus,* v. 246, no. 2, Jan. 13, 1958, p. 277-279.

Butylone-9, anthracene was synthesized by photo-polymerization of butylol-9, anthracene obtained by reducing the initial ketone. Dihydro-9,10 butylone-9, anthracene was prepared by reducing butylone-9, anthracene with Zn and NH_3.

6557* (French.) α-Cyanostyrene. **Sur l'α-cyanostyrolène.** Jean Colonge, Jacques Dreux, and Jean-Pierre Regeaud. *Comptes Rendus,* v. 246, no. 3, Jan. 20, 1958, p. 438-440.

Constitution of the α-cyanostyrene dimer. Diphenylglutaric dinitrile can be obtained by condensation of benzyl cyanide with formaldehyde.

6558* (Russian.) Preparation of Compounds With Silithiono-Carbon Links. **Poluchenie soedinenii s siltianouglerodnymi zveniami.** N. S. Nametkin, A. V. Topchiev, and L. S. Povarov. *Doklady Akademii Nauk SSSR,* v. 117, no. 2, Nov. 11, 1957, p. 245-248.

Disilanomethane pentalkylbromine derivatives obtained by the reaction of disilanemethane pentalkyl derivatives with Br were used in this preparation.

6559* (Russian.) Cyclization of 3-Ethylpentane to Ethylcyclopentane. **Tsiklizatsiia 3-etilpentana v etiltsiklopentane.** A. L. Liberman, T. V. Basina, and B. A. Kazanskii. *Doklady Akademii Nauk SSSR,* v. 117, no. 3, Nov. 21, 1957, p. 430-432.

Boiling point, refracting index, and density of the resulting compound are given.

6560 (German.) A Radical Isomerization Involving Homolytic 1,5-Hydrogen Migration. **Eine Radikalisomerisierung unter homolytischer 1,5-Wasserstoffverschiebung.** C. A. Grob and H. Kammüller. *Helvetica Chimica Acta,* v. 40, no. 7, 1957, p. 2139-2147.

Study of the thermal decomposition of ε-phenylcaproyl peroxide

as evidence of an intramolecular chain transfer reaction involving isomerization of 1-phenyl-5-pentyl radical to 1-phenyl-1-pentyl radical.

6561 (German.) Substitution in the Ring System of Lysergic Acid. **Substitutionen am Ringsystem der Lysergsäure. III.** Halogenation. **Halogenierung.** F. Troxler and A. Hofmann. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2160-2170.

Preparation and characteristics of 2-halogen derivatives of the lysergic and dihydrolysergic acid series.

6562 (German.) Investigations of the Quinuclidine Series. **Untersuchungen in der chinuclidinreihe. V.** 2-Dihydroquinuclidine and Some 3-Substituted Derivatives. **2-Dehydrochinuclidin und einige 3-Substitutionsprodukte.** C. A. Grob, A. Kaiser, and E. Renk. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2170-2185.

The properties of dehydroquinoclidines differ in many respects from those of normal tertiary vinylamines as suggested by stereoelectronic considerations.

6563 (German.) The Reduction of Cholesten-1-one-3 With Metal Hydrides and Aluminum Isopropylate. **Reduktion von Cholesten-(1)-on-(3) mit Metallhydriden und mit Aluminiumisopropylat.** R. Albrecht and Ch. Tamm. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2216-2233.

6564 (French.) Cyclization of 3,8-Dimethyl-2,7-nonadienoic Acid. **Cyclisation du diméthyl-3,8-nonadiène-2,7-oique.** Cl. Daesslé, H. Favre, and H. Schinz. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2278-2287.

Structure differs from that of geranic acid only by an additional CH_2-group in the middle of the chain.

6565 (German.) Triterpenes. Synthesis of Racemic trans-4.4,7,9-Tetramethyl-3-β-hydroxydecalone-8. **Zur Kenntnis der Triterpene. Synthese von (±)-*trans*-4,4,7,9-Tetramethyl-3β-hydroxy-decalon-(8).** J. Kalvoda and H. Loeffel. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2340-2353.

6566* Studies in the Isoquinoline Series. III. Synthesis of Some 5:6- and 5:8-Dimethoxyisoquinolines. T. R. Govindachari and M. V. Lakshmikantham. *Indian Academy of Sciences, Proceedings*, v. 46, sec. A, Dec. 1957, p. 406-415.

A series of dimethoxyisoquinolines are reported. These were dehydrogenated to the corresponding isoquinoline derivatives.

6567* (Russian.) The Nitration of Olefin Fluorides With Nitrogen Peroxide. **Nitrovanie fluorolefinov dvuokis'iu azota.** I. L. Knunianto and A. V. Fokin. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 12, Dec., p. 1439-1451.

The specific reactivity of individual olefin fluorides was determined. It resulted in the synthesis of a series of new fluororganic substances, including β-nitroperfluoralkylnitrates.

6568* (Russian.) Investigations of the Synthesis and Transformation of Silicon Vinyl Compounds. **Issledovaniia v oblasti sinteza i prevrashchenii vinilovykh soedinenii kremniia. III.** Preparation of Vinylalkylchlorosilanes by the Reaction of Acetylene With H-Containing Chlorosilanes, and the Study of Some of Their Properties. **Poluchenie vinilalkilkhlorsilanov vzaimodeistviem atsetilena s vodorodsoderzhashchimi khlorsilanami i issledovaniie ikh nekotorykh svoistv.** M. F. Shostakovskii, D. A. Kochkin, and V. L. Vinogradov. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* 1957, no. 12, Dec., p. 1452-1456.

6569* (Russian.) An Investigation of Lactams and Lactones. **Issledovanie v oblasti laktonov i laktamov. IX.** The Synthesis of Vinyl-Lactams and Some of Their Properties. **Sintez vinillaktamov i ikh nekotorye svoistva.** M. F. Shostakovskii, F. P. Sidel'kovskaia, and M. G. Zelenskaia. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 12, Dec., p. 1457-1464.

Pyrrolidone, piperidone, and caprolactam were used for studying vinylation of lactams, whereby alkali salts of lactams served as catalysts.

6570* Structure of Rhodeasapogenin. Hayao Nawa. *Japan Academy, Proceedings*, v. 33, no. 9, Nov. 1957, p. 570-573.

Discussion of structure in view of recent studies.

6571 Mercury Photosensitized Polymerization of Acetylene. S. Shida, Z. Kuri, and T. Furuoya. *Journal of Chemical Physics*, v. 28, Jan. 1958, p. 131-135.

Benzene, H, and polymer were found in the reaction products. Effect of C_2H_2 pressure and light intensity on the rate, effect of pressure on the formation of H and benzene, and effect of temperature on the rate of benzene formation were studied.

6572 Reactions of Chlorosilanes With Formaldehyde. I. Chloromethoxytrichlorosilane and Its Decomposition. II. Reaction of Silicon Tetrachloride With Formaldehyde Over Alumina. Robert E. Frost and Eugene G. Rochow. *Journal of Inorganic and Nuclear Chemistry*, v. 5, no. 3, 1958, p. 201-212.

6573 Halogenation of Pyrogallol Trimethyl Ether and Similar Systems. Dvora Friedman and David Ginsburg. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 16-17.

Halogenation of pyrogallol, its 1,3-dimethyl ether and its trimethyl ether with *t*-butyl hypochlorite, *N*-chlorosuccinimide, and *N*-bromosuccinimide.

6574 Mescaline Analogs. VIII. Substituted 5-Methoxy- and 5,6,7-Trimethoxyindoles. F. Benington, R. D. Morin, and Leland C. Clark, Jr. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 19-23.

Several 5-methoxy- and 5,6,,7-trimethoxyindole derivatives have been synthesized by the cyclization of appropriately substituted open chain amines. Convenient synthesis of 1-benzyl-3-hydroxy-3-carboethoxy-5, 6,7-trimethoxyindole and of 1-methyl-5-methoxyindole are described.

6575 Preparation of Urinary Metabolites of 3,4-Dihydroxyphenylalanine and Norepinephrine, and Related Compounds. Kenneth N. F. Shaw, Armand McMillan, and Marvin D. Armstrong. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 27-32.

6576 *p*-Cyclopentylacetophenone and Its Derivatives. P. V. Hai, N. P. Buu-Hoï, and N. D. Xuong. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 39-42.

Preparation of cyclopentylbenzene, and of *p*-cyclopentylacetophenone. Use of the latter as an intermediate for the synthesis of various aromatic and heterocyclic cyclopentyl compounds, especially *p*-cyclopentylaniline.

6577 Catalytic Hydrogenation of Ethyl 5,6-Benzocoumarin-3-carboxylate. James E. Gearien and Kenneth J. Liska. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 45-47.

Stepwise hydrogenation using W-1 Raney Ni as the catalyst, yielded ethyl 2,3,7,8,9,10-hexahydro-3-keto-1*H*-naphtho [2,1-b] pyran-2-carboxylate, 2-(2-hydroxy-5,6,7,8-tetrahydro-1-naphthylmethyl)propane-1,3-diol, and 1-isobutyl-2-decalol.

6578 Preparation and Properties of Trimethylsilyl Ethers and Related Compounds. Stanley H. Langer, Samuel Connell, and Irving Wender. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 50-58.

Hexamethyldisilazane is a convenient reagent for converting alcohols and primary amines to their trimethylsilyl derivatives. Preparation and properties of 22 new trimethylsilyl derivatives of alcohols, phenols, and amines are reported.

6579 Nuclear Substitution Derivatives of Isonicotinic Acid. H. Herbert Fox and J. T. Gibas. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 64-66.

The interaction of isonicotinic acid with thionyl chloride at elevated temperatures in accordance with the Meyer and Graf procedure results in 2-chloroisonicotinic acid.

6580 Polysoaps. II. The Preparation of Vinyl Soaps. Harold H. Freedman, J. Philip Mason, and A. I. Medalia. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 76-82.

Three types of vinyl monomers, each containing a group capable of functioning as an emulsifying agent, were prepared. One of the intermediates, 10-phenylundecanoic acid, was synthesized.

6581 Vinyl Derivatives of the Metals. VII. Preparation of Organotin Esters by Cleavage of Vinyltin Compounds. Arnold Saitow, Eugene G. Rochow, and Dietmar Seyferth. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 116-118.

By means of an organic acid the vinyl group was cleaved preferentially in tri-*n*-propylvinyltin and dimethyldivinyltin. Ethy-

lene was evolved and the corresponding tri-*n*-propyltin or dimethyltin ester remained behind.

6582 1-Keto-3-methyl-2-tetralylacetic Acid From Cyclization of β-Carboxy-γ-methyl-δ-phenyl-valeric Acid. Gordon N. Walker. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 133-135.

6583 Labeling of Some C_6 Hydrocarbons by Exposure to Tritium. Peter Riesz and Kenneth E. Wilzbach. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 6-9.

Values for the incorporation of tritium into *n*-hexane, cyclohexane, benzene, and into products of their decomposition have been determined for exposure of the hydrocarbon vapors to two pressures of tritium gas at 25 C.

6584 Radiation Chemistry of Organic Compounds. II. *n*-Hexane. H. A. Dewhurst. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 15-20.

The formation of gas and liquid products in the 800 kvp. electron radiolysis of *n*-hexane liquid was studied as a function of the energy absorbed, temperature, and the presence of solutes.

6585 The Organic Nature of Carbon Black Surfaces. Jules V. Hallum and Harry V. Drushel. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 110-117.

Evidence is presented for the existence of quinone groups and aromatic hydroxyl groups on the surface of carbon black particles.

6586 Silicones and Their Applications. J. Ames. *Journal of Scientific Instruments*, v. 35, Jan. 1958, p. 1-8.

Characteristics of polysiloxane chains and their effects on the properties of silicones. The manufacture, properties, and applications of silicone fluids, rubbers, and resins.

6587* (German.) Extremely Large Molecules. **Über extrem grosse Makromoleküle. I.** Characterizing Dextrans. **Die Charakterisierung von Dextranen.** K. Frömbling and F. Patat. *Makromolekulare Chemie*, v. 25, nos. 1-2, 1957, p. 41-52.

Dextrans enzymatically synthesized under different conditions were characterized by fractional precipitation and dissolution, measurements of extinction and viscosity, and study of the oxidation with periodic acid and the reduction value.

6588 Reactions of the Glycosylamines. Horace S. Isbell and Harriet L. Frush. *National Bureau of Standards (U. S. Atomic Energy Commission)*, NBS-5325, Dec. 1957, 39 p. (UF767 Un3.1nb Contin.)

The mutarotation, hydrolysis, and rearrangement reactions of *D*-glucosylamine, *D*-mannosylamine and *D*-xylosylamine were studied and rationalized on the basis of the formation of an intermediate acyclic imonium ion. A number of new compounds were prepared.

6589* The Point of Attack in the Oxidation of Hydrocarbons. C. F. Cullis. *Petroleum*, v. 21, Feb. 1958, p. 49 + 4 pages.

Determination of the initial position of O attack in the combustion of hydrocarbons is made on two considerations, the influence of molecular structure on the ease of gaseous oxidation and detection by means of isotopically labelled fuels.

6590 Progress in the Chemistry of Fats and Other Lipids. v. V. Advances in Technology. R. T. Holman, W. O. Lundberg, and T. Malkin, editors. 338 p. 1958. Pergamon Press, New York. (QP751 P94 Vis.)

These critical surveys of the analysis, processing, and utilization of important raw materials deal with standard analytical methods; technology of soybeans, oilseed residues, fish oils, drying oils, and edible animal fats; soap and margarine manufacture.

6591* (French.) The 1,4-Diketones Starting From Furans. **Les dicétones- 1,4 à partir des furannes. I.** Preparation and Characterization of Some Alkyl Furans. **Préparation et caractérisation de quelques alcoylfurannes.** Marcel Fétizon and Pierre Baranger. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1311-1316.

The preparation of 2, 2-5, 2-3-5, or 2-3-4-5 substituted furans is studied for their transformation into 1-4 diketones. Most of these furans were obtained by the reduction of furan ketones by HN_2-NH_2 and characterized by infra-red.

6592* (French.) Uronic Acids Present in Gelatins. **Sur les acides uroniques présents dans les gélatines.** A. M. Venet, J. Pouradier, and J. M. Landucci. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1325-1329.

According to the kinetics of uronic acid liberation by gelatins subjected or not to oxidizing treatments, gelatins contain free uronic acids, uronic acid precursors (chondroitin sulfates) liberating uronic acids, and neutral sugars able to yield uronic acid precursors.

6593* (French.) Cupric Complexes of Amino Acids; Complexes of Glycine, α and β Alanine, α and β Amino-Butyrate With Copper. **Complexes cuivriques des acides aminés; complexes de la glycine, α et β alanine, α et β aminobutyrate avec le cuivre.** B. Kirson and Isayah Barsily. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1336-1339.

The cupric ions give two kinds of complexes, along with amino acid salts. Amino acid salts containing an amino group in the α-position, produce chelated complexes with Cu; amino acid salts with an amino group in the β position, give non-chelated complexes with a catalytic effect on the decomposition of H_2O_2.

6594* (French.) Effect of Boron Trifluoride on Aldehydes and Ketones. **Action du trifluorure de bore sur les aldéhydes et les cétones. I.** Products of Addition (Coordination Complexes). **Les produits d'addition (complexes de coordination).** René Lombard and Jean-Paul-Stéphan. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1369-1373.

A study of the effect of BF_3 at different temperatures either in the gaseous state or in the form of its etherate. Fixation of the BF_3 molecule to molecule of aldehydes and ketones. Empirical formula of the addition product.

6595* (French.) Research on Thymol. **Recherches sur le thymol. IX.** Behavior of the 4-Substituted Thymol Derivatives of Methyl Ethers in Reactions Catalyzed by Metallic Halides. **Sur le comportement des éthers méthyliques des dérivés 4-substitués du thymol dans les réactions catalysées par les halogénures métalliques.** René Royer, et al. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1379-1388.

Cleavage of the isopropyl chain or a substitution at position two as the effect of acetyl-, benzoyl, or alkanoyl long-chain chlorides on methyl-4, methoxy-4, and chloro-4-thymol methyl esters in a thiocarbonic medium in the presence of $AlCl_3$.

6596* (French.) The Circular Electronic Transfer in the Interpretation of Certain Reactions in Organic Chemistry. **Le transfert électronique circulaire dans l'interprétation de certaines réactions de la Chimie organique.** Jean Mathieu and Jacques Valls. *Société Chimique de France, Bulletin*, 1957, nos. 11-12, Nov.-Dec., p. 1509-1541.

A general article involving transfer with four, six, eight, five, three, seven, and nine centers. Bicyclic transfers.

6597 Research on Thermostable Molecules and Polymers. Emil A. Lawton and Donna D. McRitchie. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 57-642, Nov. 1957, 84 p. (TL507 Un3.18w Vis.)

Syntheses for polymers containing the benzotetraazaporphin structure were studied. Phthalocyanine can be prepared quantitatively from o-phthalonitrile, and metallated phthalocyanines can be prepared from 1,3-diiminoisoindoline. Cu-poly-benzotetraazoporphin of various compositions was prepared by the urea method from pyromellitic dianhydride and phthalic anhydride.

6598* (German.) The Incorporation of Solvents in Organic Beryllium Salts. **Lösungsmitteleinschlüsse bei organischen Berylliumsalzen. V.** Beryllium Oxypropionate, Beryllium Oxychloroacetate. **Berylliumoxypropionat, Berylliumoxychloracetat.** Horst Dietrich Hardt. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 293, nos. 1-2, Dec. 1957, p. 47-52.

Freshly prepared specimens of these salts desorb below 130 C the excess of the acid included in prisms, without changing their structure.

6599* (English.) **Organic Compounds of Zirconium. III. Study of Catechol Derivatives of Zirconium by Electrometric Titrations. IV. Study of Catechol Derivatives of Zirconium by Conductometric and Precipitation Methods.** R. N. Kapoor and R. C. Mehrotra. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 293, nos. 1-2, Dec. 1957, p. 92-108.

6600* (Russian.) Spectrophotometric Investigation of Diphenylamine and Its Derivatives in Concentrated Sulfuric Acid. **Spektrofotometricheskoe issledovanie difenilamina i ego proizvodnykh v kontsentrirovannoi sernoi kislote. II.** Absorption Spectra of Two-Substituted π-Oxy- and π-Methoxy Derivatives of Diphenylamine. **Spektry pogloshcheniia dvuzameshchennykh π-oksi- i π-metoksiproizvodnykh difenilamina. III.** Comparison of the Absorption Spectra of Different π-Oxy- and π-Methoxy Derivatives of Diphenylamine. **Sravnenie spektrov pogloshcheniia razlichnykh π-oksi- i π-metoksiproizvodnykh difenilamina.** P. M. Bugai. *Zhurnal Obshchei Khimii*, v. 27, no. 12, Dec. 1957, p. 3226-3241.

Different diphenylamine derivatives treated with H_2SO_4 form solutions of the same color, and their spectral curves are similar, but their absorption maximums have different intensities.

6601* (Russian.) Electroreduction as a Method of Investigation of Albumin. **Elektrovosstanovlenie kak metod issledovaniia belka. I.** Study of the Substances Formed During Electroreduction of Certain Diketopiperazidines. **Izuchenie veshchestv, obrazuiushchikhsia pri elektrovosstanovlenni nekotorykh diketopiperazinov.** T. I. Orlova and N. I. Gavrilov. *Zhurnal Obshchei Khimii*, v. 27, no. 12, Dec. 1957, p. 3314-3321.

Electroreduction on Hg cathode of several diketopiperazidines, including the anhydride forms of glycine, alanine, glycylalanine, and glycylphenylalanine. Piperazidines are formed as a result of electroreduction, and their structure was shown by the preparation of picrates. A system of the solvents for the chromatographic separation of piperazidines is suggested.

6602* (Russian.) Study of the Synthesis of Organosilicon Compounds. **Issledovanie v oblasti sinteza kremniiorganicheskikh soedinenii. V.** Preparation of Polysiloxanes With Mixed Radicals. **Poluchenie polisiloksanov so smeshannymi radikalami.** A. L. Klebanskii, V. S. Fikhtengolts, and A. V. Karlin. *Zhurnal Obshchei Khimii*, v. 27, no. 12, Dec. 1957, p. 3321-3324.

Chlorination of dimethyldichlorosilane and trimethylchlorosilane under ultra-violet light and separation of the products. Hydrolysis of these products and their mixtures with dimethyldichlorosilane by CH_3OH. Physical-mechanical properties of rubberlike polysiloxanes are decreased by the presence of chloromethyl groups (up to 20 mole %).

6603* (Russian.) Complex Compounds of SnCl, $SnBr_4$, and $TiCl_4$ With Cineole. **Kompleksnye soedineniia $SnCl_4$, $SnBr_4$ i $TiCl_4$ s tsineolom.** T. Sumarokova and Iu. Nevskaia. *Zhurnal Obshchei Khimii*, v. 27, no. 12, Dec. 1957, p. 3375-3379.

$SnCl_4 \cdot 2C_{10}H_{18}O$; $SnBr_4 \cdot 2C_{10}H_{18}O$, and $TiCl_4 \cdot 2C_{10}H_{18}O$ were prepared. Despite its high mol. wt. (746.8) the $SnBr_4 \cdot 2C_{10}H_{18}O$ sublimes at 35 C.

See also: **6219** (chemistry of Jojoba nut oil); **6409** (surface active agents and detergents).

CHEMISTRY—PHYSICAL

6604* (English.) **Some $\Delta\epsilon$-Curves for Dissociations of Tropolones and Salts of Organic Bases.** Gunhild Aulin-Erdtman and Laila Hegbom. *Acta Chemica Scandinavica*, v. 11, no. 9, 1957, p. 1550-1556.

In order to explore the applicability of the $\Delta\epsilon$-method to ionizable compounds other than phenols, the $\Delta\epsilon$-curves were determined for a series of simple tropolones, arylamines, and heterocyclic bases.

6605* (English.) **Spectroscopic Conformational Analysis of Some 1,2-Dihalogeno *Cyclo*hexanes.** Peter Klaeboe, Johan J. Lothe, and K. Lunde. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1677-1691.

The infrared spectra of the *trans* 1,2-dichloro- and *trans* 1,2-dibromo-*cyclo*hexanes are highly dependent on the dielectric properties of the solvents. Possibility of determining the conformational equilibrium ratio.

6606* (English.) **The Heats of Hydrolysis of Some Alkyl Thiolesters.** Ingemar Wadsö. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1745-1751.

6607* (English.) **Studies on the Extraction of Metal Complexes. XXX. The Dissociation, Distribution and Dimerization of Di-*n*-Butyl Phosphate (DBP).** David Dyrssen. *Acta Chemica Scandinavica*, v. 11, no. 10, 1957, p. 1771-1786.

The solubility and acidity of DBP in water and the distribution of DBP between $CHCl_3$ or methyl *iso*butyl ketone and $HClO_4$-$NaClO_4$ solutions was studied at 25 C.

6608* (English.) **Studies on the Adsorption of Gas Mixtures. I. Statistical Theory of Physical Adsorption of the Langmuir-Type in Multicomponent Systems.** Géza Schay, Pál Fejes, and József Szathmáry. **II. A New Chromatographic Method for Determination of Mixed Adsorption; Adsorption of CO_2—C_2H_2 Mixtures on Charcoal.** Géza Schay, György Székely, and Gizella Szigetváry. *Acta Chimica Academiae Scientiarum Hungaricae*, v. 12, nos. 3-4, 1957, p. 299-324.

The theory developed formerly by G Schay for the case of a pure gas is extended to the case of simultaneous adsorption of more than one gas. The theory, in accordance with experience, indicates that the individual Langmuir constants *b* have to be taken with somewhat altered values in the case of mixed adsorption. It is shown that the empirical rule of Lewis and Gilliland can be explained theoretically. A new method of frontal gas chromatography was evolved to the special end of determining adsorption isotherms of pure gases and of mixtures, based on continuous measurement and comparison of the rates at which the gas is fed onto the adsorption column and of that at which it emerges. Isotherms of CO_2 and C_2H_2 as pure gases and in mixtures were determined by the method developed and the results compared with the theory derived in Part I. The main propositions of this theory could be related to experimental facts.

6609 (English.) **Dislocation Patterns in Potassium Chloride.** S. Amelinckx. *Acta Metallurgica*, v. 6, no. 1, Jan. 1958, p. 34-58.

Dislocation patterns observed in "single crystals" of KCl, as grown, and after deformation, are analyzed. Evidence is presented for the stability of an a[100] dislocation with respect to dissociation into two $a/2$[110] dislocations.

6610* (German.) The Theory of the Rate of Crystal Growth. **Zur Theorie der Kristallisationsgeschwindigkeit.** R. Kaischew. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 75-81.

The linear velocity of crystal growth in perfect crystals is determined with the Becker-Döring method. In the case of a small oversaturation, the formation of each two-dimensional nucleus leads to the addition of a new atom layer on the crystal surface.

6611* (English.) **On the Mechanism of the Growth of Quartz Crystals.** Gy. Zimonyi. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 119-127.

On a number of natural and synthetic crystals, growth figures become visible after the crystals have been subjected to a proper etching process. Some of the etch figures may be interpreted in terms of the dislocation theory.

6612* Investigation of the Uranium Content of Coal Ashes With Nuclear Emulsion. E. Bujdosó, L. Medveczky, and A. Szalay. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 195-201.

Ashes of pulverized uraniferous brown coals were embedded in nuclear emulsion. The active grains were examined, and statistical data on the shape and number of the emitted tracks were compiled. The grains fused into spherical shapes are the carriers of the greater part (70.6%) of the total activity.

6613* (Russian.) Study of the Mixed Catalysts, Pd-Ag, Pd-Cu, and Pd-Au, in Benzene Hydration. **Izuchenie smeshannykh Pd-Ag, Pd-Cu, Pd-Au katalizatorov pri gidrirovanii benzola. II.** Study of Mixed Pd-Cu Catalysts. **Izuchenie smeshannykh Pd-Cu katalizatorov.** A. A. Alchudzhan and E. T. Kristosturian. *Akademiia Nauk Armianskoi SSR, Izvestiia*, v. 10, no. 5, 1957, p. 333-340.

Shows that the activity of the mixed catalyst Pd-Cu is lower than that of the pure Pd, reaching zero at 70% Cu content.

6614 Photolysis and Pyrolysis of 2-Pentanone-1,1,1-3,3-d_5. J. R. McNesby and Alvin S. Gordon. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 261-264.

The photolysis of $CD_3COCD_2CH_2CH_3$ was studied from 35 to 300 C. Pyrolysis was studied at about 500 C. Under photolysis the ethylene/acetone ratio was found sensitive to flux density of the radiation; with pyrolysis the reaction is by a free radical mechanism.

6615 The Structure and Bonding of Cyclopentadienylthallium and Bis-Cyclopentadienylmagnesium. F. A. Cotton and L. T. Reynolds. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 269-273.

Infra-red spectra are in accord with C_{5v} molecular symmetry for C_5H_5Tl and a sandwich configuration for $(C_5H_5)_2Mg$. Bonding in C_5H_5Ti is ionic, suggested by chemical evidence.

6616 The Kinetics of Dissociation of Derivatives of Iodobenzene Dichloride in Acetic Acid. R. M. Keefer and L. J. Andrews. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 277-281.

6617 The Kinetics of the Decomposition of Sodium *p*-Toluenesulfonylacetate in Water-Ethylene Glycol and Water-Dioxane Mixtures. Donald J. O'Connor and Frank H. Verhoek. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 288-290.

6618 Energetics of the Boranes. V. Prediction of Heats of Formation. Interconversion of the Hydrides of Boron. S. H. Bauer. *American Chemical Society, Journal*, v. 80, Jan. 20, 1958, p. 294-298.

6619 Kinetics and Mechanism of Chlorination of Triethylphosphorothiolate in Dilute Aqueous Media at 25°. Nicholas G. Lordi and Joseph Epstein. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 509-515.

6620 Infrared Absorption Studies of Inorganic Coördination Complexes. XIII. Hexamminecobalt(II) Halides and Diamminemercury(II) Halides. E. P. Bertin, et al. **XIV. Infrared Studies of Some Metal Thiourea Complexes.** A. Yamaguchi, et al. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 525-529.

6621 Etherates of Lithium Borohydride. II. The System Lithium Borohydride-Diethyl Ether. Thaddeus L. Kolski, Helen B. Moore, Lillian E. Roth, Kenneth J. Martin, and Goerge W. Schaeffer. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 549-552.

Pressure-composition isotherms at 25.0, 0.0, −35.3, −45.2, and −63.5 C indicate that two solid diethyl etherates, $LiBH_4 \cdot (C_2H_5)_2O$ and $(LiBH_4)_2 \cdot (C_2H_5)_2O$ exist.

6622 The Lead Tetraacetate Oxidation of *cis*- and *trans*-9,10-Diaryl-9,10-dihydro-9,10-phenanthrenediols. A Kinetic Study. Emil J. Moriconi, Friedrich T. Wallenberger, and William F. O'Connor. *American Chemical Society, Journal*, v. 80, Feb. 5, 1958, p. 656-661.

6623* (English.) **On the Reactivity of Ions and Ion-Pairs in the Dieckmann Condensation.** Arne Brändström. *Arkiv för Kemi*, v. 11, no. 6, 1957, p. 527-533.

The velocity of the Dieckmann condensation of ethyl *o*-carbethoxyphenoxyacetate to 2-carbethoxy-3-hydroxybenzofuran by means of alkali ethoxides in pure alcohol was measured.

6624* (English.) **A Flash Photolysis Apparatus for Photochemical Studies at Very High Light Intensities and Energies.** Stig Claesson and Lars Lindqvist. *Arkiv för Kemi*, v. 11, no. 6, 1957, p. 535-559.

During the photolysis flash, which lasts to 150 μsec., the number of quanta absorbed in the reaction vessel is from 4 to 45 x 10^{20} or from 1 to 7 x 10^{-3} Einstein.

6625* (English.) **On the Reactivity of Ions and Ion-Pairs in Some Base-Catalysed Reactions.** Arne Brändström. *Arkiv för Kemi*, v. 11, no. 6, 1957, p. 567-590.

The reactivity of some ions and ion-pairs in alcoholic solutions have been recalculated from kinetic results, using an extrapolation method that makes it possible to reduce greatly the errors which result from primary salt effects.

6626 Empirical Evaluation of the Properties of Steam at Elevated Temperatures and Pressures. A. W. Lemmon, et al. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-858, Aug. 1953, 63 p. (UF767 U3b Contin.)

Specific volume, enthalpy, specific heat, viscosity, and thermal conductivity were studied at temperatures and pressures up to 1600 F and 21,000 psi. a.

6627 Some Physical Properties of Potassium Sodium Tartrate Crystals Subjected to Radioactive Irradiation. I. S. Zheludev and V. A. Yurin. *Henry Brutcher Translation No.* 3860, 7 p. (From *Izvestiya Akademii Nauk SSSR, Ser. Fiz.*, v. 20, no. 2, 1956, p. 211-214.) Henry Brutcher, Altadena, Calif.

6628 The Limiting Equivalent Conductances of Ammonium Chloride, Ammonium Bromide, and Ammonium Nitrate at 35.00°C. A. N. Campbell and E. Bock. *Canadian Journal of Chemistry*, v. 36, Feb. 1958, p. 330-338.

6629 The Liquid Phase Photolysis of Diethyl Ketone and Methyl Ethyl Ketone. P. Ausloos. *Canadian Journal of Chemistry*, v. 36, Feb. 1958, p. 400-409.

6630 Theral Data for Chlorine and HCl. C. J. Dobratz. *Chemical Engineering*, v. 65, Feb. 1958, p. 144-146.

Pressure-enthalpy diagrams are given.

6631* (English.) **Spectrochemical Study of Microscopic Crystals. XVI. Structure of Cupric Formate, Acetate and Propionate.** Shoichiro Yamada, Hiroji Nakamura, and Ryutaro Tsuchida. *Chemical Society of Japan, Bulletin*, v. 30, no. 9, Dec. 1957, p. 953-957.

6632* (English.) **The Vapor Pressure of Germanium Dioxide.** Eiichi Shimazaki, Noboru Matsumoto, and Kichizo Niwa. *Chemical Society of Japan, Bulletin*, v. 30, no. 9, Dec. 1957, p. 969-971.

Measured by Knudsen's effusion method from 1040 C up to the melting point.

6633 Nitrosation, Diazotisation, and Deamination. I. Principles, Background, and Method for the Kinetic Study of Diazotisation. II. Second- and Third-Order Diazotisation of Aniline in Dilute Perchloric Acid. E. D. Hughes, C. K. Ingold, and J. H. Ridd. **III. Zeroth-Order Diazotisation of Aromatic Amines in Carboxylic Acid Buffers.** E. D. Hughes and J. H. Ridd. **IV. Hydrogen-Ion Catalysis in the Diazotisation of *o*-Chloroaniline in Dilute Perchloric Acid.** E. D. Hughes, C. K. Ingold, and J. H. Ridd. **V. Catalysis by Anions of Strong Acids in the Diazotisation of Aniline and of *o*-Chloroaniline in Dilute Perchloric Acid.** E. D. Hughes and J. H. Ridd. **VI. Comparative Discussion of Mechanisms of *N*- and *O*-Nitrosation With Special Reference to Diazotisation.** E. D. Hughes, C. K. Ingold, and J. H. Ridd. *Chemical Society, Journal*, 1958, Jan., p. 58-98.

6634 Kinetics of the Bromination of Some Aromatic Amines. R. P. Bell and Eileen N. Ramsden. *Chemical Society, Journal*, 1958, Jan., p. 161-167.

Redox potentials were used to follow the rate of bromination of *NN*-dialkylanilines in strongly acid solution, Br concentrations in the range 10^{-2}–$10^{-1}M$ being used.

6635 Kinetics of the Reaction Between 2-Ethoxycarbonyl-2-iodocyclohexanone and Iodide Ions. R. P. Bell and D. C. Vogelsong. *Chemical Society, Journal*, 1958, Jan., p. 243-245.

6636 Kinetics of Formation of Ethylenediaminetetra-acetatocobalt(III) From the Corresponding Monoaquo- and Monohydroxo-Complexes in Aqueous Solutions. I. A. W. Shimi and W. C. E. Higginson. *Chemical Society, Journal*, 1958, Jan., p. 260-263.

6637 Equilibrium Constants for the Reaction Between Bromine and Bromide Ions at 5°, 25°, and 35° in Aqueous Medium of Constant Ionic Strength and Acidity. D. B. Scaife and H. J. V. Tyrrell. *Chemical Society, Journal*, 1958, Jan., p. 386-392.

6638 The Interaction of Metal Chlorides With Organic Chlorides. I. Freezing-Point Phase Diagrams of Titanium Tetrachloride With Some Alkyl Chlorides. W. R. Longworth, P. H. Plesch, and M. Rigbi. *Chemical Society, Journal*, 1958, Jan., p. 451-457.

The freezing-point phase diagrams of $TiCl_4$ with six alkyl chlorides were determined using a greaseless high-vacuum system. With methyl chloride, methylene dichloride, and chloroform, $TiCl_4$ forms simple eutectic systems. With ethyl chloride, *iso*propyl chloride, and ethylidene dichloride the phase diagrams show discontinuities.

6639* (English.) **Concentration of the Isotope ^{15}N by a Chemical Exchange Reaction.** A. Zeman and V. Čermák. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 6, Dec. 1957, p. 1722-1726.

The construction and operation of a column for the concentration of ^{15}N by a chemical exchange reaction between NH_3 and ammonium ions. When using a packing of glass cloth an enrichment of the ^{15}N content by 11.4 at.% was attained.

6640* (English.) **Mutual Dependence of the Equilibrium Compositions of Phases in Multicomponent System. I. Binary Systems.** E. Hála. *Collection of Czechoslovak Chemical Communications*, v. 22, no. 6, Dec. 1957, p. 1727-1735.

Proposes an equation suitable for binary systems at constant temperature or pressure. Examples are given.

6641* (French.) Kinetic Law of the Formation and Decomposition of Surface Oxides on Graphite. **Loi cinétique de la formation et de la décomposition des oxydes de surface sur le graphite.** Lucien Bonnetain, Xavier Duval, and Maurice Letort. *Comptes Rendus*, v. 246, no. 1, Jan. 6, 1958, p. 105-107.

A study of O adsorption on artificial graphite followed by desorption as CO and CO_2, showed that the two phenomena closely follow the law.

6642* (Russian.) Proton Resonance in Non-Aqueous Solutions of Paramagnetic Salts. **Protonnyi rezonans v nevodnykh rastvorakh paramagnitnykh solei.** A. I. Rivkind. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 448-451.

Crystal hydrate solutions of paramagnetic salts of the iron group in dehydrated acetone and alcohol were studied.

6643* (Russian.) The Reactivity of Five- and Six- Member Heterocyclic Compounds. **O reaktsionnoi sposobnosti piati- i shestichlennykh geterotsiklicheskikh soedinenii.** S. M. Skuratov, A. A. Strepikhieev, and M. P. Kozina. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 452-454.

Determining enthalpy of cyclization of monosaccharides of γ- and δ-form, polymerization of which plays on important role in the biosynthesis of natural compounds.

6644* (Russian.) The Electric Conductivity Method in Studying Powdered Metallic Catalysts in a Liquid Phase. **Metod elektroprovodnosti pri issledovanii poroshkoebraznykh metallicheskikh katalizatorov v zhidkoi faze.** D. V. Sokolskii and V. V. Malakhov. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 455-457.

Nickel and Pt powders in N-heptane, benzene, 96% alcohol, and glacial acetic acid were studied. In the case of Ni, the conductivity decreases after 50 C, and in the case of Pt after 70 C.

6645 Intensities in Raman Spectra. VI. Bromomethanes and Methyl Iodide. D. A. Long and D. C. Milner. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 1-10.

Data on CBr_4, $CHBr_3$, CH_2Br_2, CH_3Br, and CH_3I.

6646 Dissociation Constants of Hydroxy Coumarins. B. N. Mattoo. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 19-24.

The 5-, 6-, and 7-hydroxy coumarins were studied spectrophotometrically.

6647 The Lattice Energies of Potassium, Rubidium and Caesium Bifluorides and the Strength of the Bonds in the Bifluoride, HF_2, Ion. T. C. Waddington. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 25-33.

6648 The Basicity of Aromatic Hydrocarbons. I. Unsubstituted Polynuclear Compounds. E. L. Mackor, A. Hofstra, and J. H. van der Waals. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 66-83.

A study of the basicity of polynuclear aromatic hydrocarbons in anhydrous HF at zero C.

6649 The Solubilities of Sparingly Soluble Salts in Water. V. The Solubility of Barium Sulphate at 25°C. D. R. Rosseinsky. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 116-118.

6650 The Photosorption of Oxygen and Nitric Oxide on Titanium Dioxide. David R. Kennedy, Mowbray Ritchie, and John Mackenzie. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 119-129.

6651 The Effects of Carbon Content on the Rate of Dissolution of Dingot Uranium in Nitric Acid. A. L. Bement and J. L. Swanson. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-52430, Nov. 1957, 20 p. (UF767 Un3.1hw Contin.)

Specimens of varying C content were heat treated and dissolved in HNO_3. Dissolution rates were determined for the linear, initial portion of the weight-loss vs. time curves. A universal relationship was observed between grain size and rate of dissolution but not between the latter and C content.

6652 (German.) Infra-Red Spectra of Cyclanes and Cyclanones. **Infrarotspektren der Cyclane und Cyclanone. II.** Theoretical Survey of the Vibration Spectra. **Theoretische Übersicht über die Schwingungsspektren.** E. Billeter, Th. Bürer, and Hs. H. Günthard. **III.** Liquid and Solid Spectra of Cyclanone. **Flüssigkeits-und Festkörperspektren der Cyclanone.** Th. Bürer and Hs. H. Günthard. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2046-2074.

Spectra discussed in terms of approximate group vibrations and in relation to several conformations of symmetry groups C_{2v}, C_{2h} and their subgroups. Theoretical spectra for these ring molecules are compared with those of linear chain alkanes.

6653 (German.) Focusing Ion Exchange. **Über fokussierenden Ionenaustausch. IV.** Theoretical Study of Focusing Effects. **Zur Theorie des Fokussierungseffektes.** Ernst Schumacher. *Helvetica Chimica Acta*, v. 40, no. 7, 1957, p. 2322-2340.

Concentration focusing in electrophoresis. Effect of process parameters on the line-width of a focused substance.

6654* Temperature Dependence of Photo-Elastic Constants in Alkali Halides. S. Bhagavantam and Y. Krishna Murty. *Indian Academy of Sciences, Proceedings*, v. 46, sec. A, Dec. 1957, p. 399-405.

Measurements on the birefringence produced at different temperatures in crystals subjected to stress show that the stress-optical coefficients decrease in the case of NaCl almost linearly with temperature while in KCl and KBr they increase.

6655* Polarographic Behaviour of Metals in Ethanolamines. VI. Lead. VII. Zinc. R. S. Subrahmanya. *Indian Academy of Sciences, Proceedings*, v. 46, sec. A, Dec. 1957, p. 433-453 + 2 plates.

6656 Pyrolysis of Aromatics and Related Heterocyclics. John J. Madison and Richard M. Roberts. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 237-250.

Liquid phase pyrolysis at 425 to 500 C of 43 aromatics and heterocyclics was studied to find features of molecular structure responsible for formation of products of higher mol. wt.

6657* (Russian.) Compressed Hydrocarbon Gases as Solvents for Petroleum and Petroleum Residues. **Szhatye uglevodorodnye gazy kak rastvoriteli nefti i neftianykh ostatkov.** T. P. Zhuze and G. N. Iushkevich. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 11, Nov., p. 63-68.

Solubility increases with the increase of pressure (100 to 800 atm.) and temperature, and depends on the composition of the petroleum. The solubility of the hydrocarbon gases in relation to petroleum increases in the order; methane, ethane, ethylene, and propene.

6658 The Preparation of Crystalline δ-Alumina. H. P. Rooksby. *Journal of Applied Chemistry*, v. 8, Jan. 1958, p. 44-49.

Three methods are described for preparing one of the transition forms of alumina, the δ-form, in a comparatively advanced state of crystallinity. Starting with the bayerite form of the trihydrate, the alterations take place in the sequence bayerite→monohydrate→γ→δ→θ→α-alumina. Crystal structure is sufficiently well-developed for complete X-ray powder diffraction spacing and intensity data to be compiled.

6659 Electrodialysis Using Ion-Exchange Membranes. I. Factors Limiting the Degree of Desalting. S. M. Partridge and A. M. Peers. **II. Demineralization of Solutions Containing Amino-Acids.** A. M. Peers. *Journal of Applied Chemistry*, v. 8, Jan. 1958, p. 49-67.

6660 Irreversible Electrochemical Processes of Membranes. Yonosuke Kobatake. *Journal of Chemical Physics*, v. 28, Jan. 1958, p. 146-153.

Theoretical equations of membrane potentials and the permeation rates of ions through membranes are derived from the entropy production in the membranes.

6661 Electron Diffraction Study on the Rotational Isomerism in *n*-Propyl Chloride. Yonezo Morino and Kôzo Kuchitsu. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 175-184.

The following structural parameters were obtained: C-Cl= $1.77_8 \pm 0.02$ A, C-C= $1.53_5 \pm 0.02$ A, and the angle C-C-Cl= $111° \pm 2°$. It was confirmed that there are two isomers in the vapor phase; one is the *trans*-form and the other is the *gauche*-form.

6662 Molecular Structure and Internal Rotation of Hexachloroethane, Hexachlorodisilane, and Trichloromethyl-Trichlorosilane. Yonezo Morino and Eizi Hirota. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 185-197.

The heights of the potential barrier obtained were 10.8, 4.3, and 1 kcal/mole for C_2Cl_6, $SiCCl_6$, and Si_2Cl_6 respectively

6663 Vibrational Spectra and Thermodynamic Properties of ClF_3 and BrF_3. Howard H. Claassen, Bernard Weinstock, and John G. Malm. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 285-289.

6664 Application of the Pariser and Parr Method to Dye Ions With Amidinium Resonance. Sean P. McGlynn and William T. Simpson. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 297-300.

The transition energies and transition probabilities for the family of dye ions $Me_2N\text{-}(CH{=}CH)_{n1}\text{-}CH{=}NME_2$ are calculated. The nitrogens are taken into account by a perturbation method. Configuration interaction considering single excitations from the ground configuration is employed.

6665 Kinetics of Gas Phase Halogenation Reactions. Sidney W. Benson and Jerry H. Buss. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 301-309.

Making use of the independently measured rate constants for the reactions $X+X+M \rightleftharpoons X_2+M$ (where X=Br, I, etc.) it is possible to calculate the times needed to approach the stationary state for X atoms. On applying these results to kinetic studies, it is found that for most thermal brominations, the times are in excess of 100 sec. For thermal chlorinations, the times are in excess of 1000 sec., while for more strongly bonded diatomic molecules they are still higher.

6666 Effect of Pressure on Cyanide and Carbonyl Spectra in Solution. R. R. Wiederkehr and H. G. Drickamer. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 311-316.

The C=N vibration of CH_3CN was studied in a series of solvents, most substituted methanes, to 10,000 atm. pressure. Shapes of the curves of frequency vs. pressure can be predicted reasonably well from a model which considers the interaction of each bond of the solvent molecule with the CN bonds. Similar measurements and calculations were made for the C=O vibration in a series of compounds, using CS_2 as the solvent.

6667 Organic Ions in the Gas Phase. VI. The Dissociation of *p*-Xylene Under Electron Impact. Seymour Meyerson and Paul N. Rylander. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 2-5.

6668 Effects of Phase on Reactions Induced by Radiation in Organic Systems. T. O. Jones, R. H. Luebbe, Jr., J. R. Wilson, and J. E. Willard. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 9-15.

6669 The Radiation Chemistry of Isopropyl Acetate and Isopropenyl Acetate. Amos S. Newton and Peter O. Strom. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 24-29.

6670 The Determination of Heats of Adsorption by Gas-Solid Chromatography. S. A. Greene and H. Pust. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 55-58.

Values for some low boiling gases on charcoal and light hydrocarbons on alumina and silica gel are determined and found to agree well with those obtained calorimetrically and isosterically.

6671 The System Zirconium-Nickel and Hydrogen. George G. Libowitz, Herbert F. Hayes, and Thomas R. P. Gibb, Jr. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 76-79.

The interaction of the intermetallic compound ZrNi with H was studied, and pressure-composition isotherms were obtained at 100, 200, and 250 C.

6672 The Solubility of Helium, Neon, Argon, Krypton and Xenon in Methylcyclohexane and Perfluoromethylcyclohexane. H. Lawrence Clever, J. H. Saylor, and P. M. Gross. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 89-91.

6673 Vapor Pressures and Derived Thermodynamic Information for the System RbF-ZrF_4. S. Cantor, R. F. Newton, W. R. Grimes, and F. F. Blankenship. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 96-99.

Eleven compositions, ranging from 35 to 100 mole % ZrF_4 were studied. In this range the RbF is non-volatile in comparison with ZrF_4, and hence approximate activities could be derived directly from total pressure measurements.

6674 Catalytic Hydrogenation of Ethylene Over Evaporated Nickel. John G. Foss and Henry Eyring. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 103-106.

Hydrogenation was studied and found to be zero order in ethylene and first order in H for pressures of 0.03 to 300 mm. with an activation energy of 8 kcal.

6675* (German.) The Effect of Lead Acetate on Phenol. **Über die Einwirkung von Bleitetraacetat auf Phenole. VI.** W. Metlesics, E. Schinzel, H. Vilcsek, and F. Wessely. *Monatshefte für Chemie*, v. 88, no. 6, 1957, p. 1069-1076.

Oxidation of phenols with lead acetate; isolation of 2.5-dimethyl-o-quinoacetate, 2-methyl-5-phenyl-o-quinoacetate, 3.4.5-triphenyl-p-quinoacetate; preparation of diacetates of 2-hydroxy-o-quinones and 5-methyl-2-hydroxy-o-quinones by means of lead tetracetate oxidation of the corresponding phenols.

6676 *K*-Emission Spectrum of Metallic Lithium. D. E. Bedo and D. H. Tomboulian. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 35-40.

Intensity distribution of the characteristics *K* emission band was determined. Some features of the distribution $I(E)/v^3$ are presented.

6677 Superexchange Interaction. J. Yamashita and J. Kondo. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 730-741.

MnO crystal is studied by using the Heitler-London picture including overlap. Mechanisms proposed by Slater, Kramers and Anderson, and Goodenough are developed on the same basis. The energy difference between the antiparallel spin state and the parallel spin state is computed numerically in the case of the simple four-electron problem.

6678 Apparatus for the Direct Measurement of Adsorption on Solid Surfaces From Liquids. James A. Kafalas and Harry C. Gatos. *Review of Scientific Instruments*, v. 29, Jan. 1958, p. 47-50.

Technique is applicable only to very dilute solutions in which the solute can be tagged with a γ- or hard β-emitting isotope. The adsorbed radioactivity of the surface is determined through a continuously replenished thin layer of solution.

6679 The Decomposition of *n*-Hexane. I. By Mercury Photosensitization. II. By Reaction With Atomic Hydrogen. R. G. W. Norrish and J. H. Purnell. *Royal Society, Proceedings*, v. 243, ser. A, Feb. 11, 1958, p. 435-457.

6680 Unusual Liquid-Solid Transition Effects in a Methoxypentamiethylflavan. J. J. Benbow and D. J. C. Wood. *Royal Society, Proceedings*, v. 243, ser. A. Feb. 11, 1958, p. 518-533 + 4 plates.

The solid phase of 2'-methoxy-2,4,4,7,4'-pentamethylflavan differs in many respects from normally crystalline materials, yet is not amorphous. It tends to form spherical masses which exhibit no regular crystal boundaries. Variations in external conditions during solidification can give rise to three superficially different forms of the solid phase. The solid-liquid and liquid-solid transitions were followed by measurements of density, rigidity, and dielectric constant, all of which give further indications of the diffuse nature of the melting process and the existence of hysteresis between melting and solidification.

6681* (English.) **The Ultra-Violet Absorption Spectra of Substituted Phenyl Amino-1,2,3-Triazoles.** E. Lieber, C. N. R. Rao, and T. S. Chao. *Spectrochimica Acta*, v. 10, no. 3, Jan. 1958, p. 250-258.

Influence of the substituents in the 1-, 4-, and 5-positions is discussed.

6682* (English.) **Spectroscopic Studies on Rare-Earth Compounds. I. Instrumentation. II. A Comparative Study of the Absorption Spectra of the Neodymium Ion in Aqueous Solution and in Crystalline Salts.** P. Krumholz. *Spectrochimica Acta*, v. 10, no. 3, Jan. 1958, p. 269-280.

A grating spectrophotometer covering the range of 3600-9500 Å with a spectral band width of less than 1 Å is described. Spectra of solutions of neodymium percholorate between 4000 Å and 9000 Å were measured at 3 C.

6683* (English.) **Infrared Spectra of Silyl and Silyl-d_3 Cyanides.** H. Richard Linton and Eugene R. Nixon. *Spectrochimica Acta*, v. 10, no. 3, Jan. 1958, p. 299-306.

6684* (English.) **The Vibrational Spectra and Structure of Ferrocene and Ruthenocene.** Ellis R. Lippincott and Richard D. Nelson. *Spectrochimica Acta*, v. 10, no. 3, Jan. 1958, p. 307-329.

Spectra were consistent with the D_{5d} model proposed for the bis*cyclo*pentadienyl metal compounds. A normal coordinate analysis was carried out using the vibrational assignment for a ferrocene *cyclo*pentadienyl ring.

6685 The Kinetics of the Complexing of Ferric Ion by Thiocyanate and Chloride Ions. Claude Peter Coppel. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-8059, Dec. 1957, 92 p. (UF767 U3u Contin.)

6686* (Polish.) Mechanism of the Formation of Colloidal Particles. **O mechanizmie powstawania cząstek koloidalnych.** Antoni Basiński. *Wiadomości Chemiczne*, v. 11, Nov. 1957, p. 638-648.

Theory of the formation of nuclei compared with the formation of a new crystalline phase. Theory of spontaneous crystallization.

6687 The High-Temperature Kinetics of the Hydrogen-Bromine Reaction. Arthur Levy. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 57-486, Oct. 1957, 21 p. (TL507 Un3.18w Vis.)

Study of the reaction of H_2 and Br_2 in a flow system between 600 and 1470 K shows that the low temperature steady-state mechanism is unchanged between these temperatures.

6688* (German.) Physical and Chemical Properties of the Silica gel/Water System. **Physikalische und chemische Eigenschaften des Systems Silicagel/Wasser. I.** The Determination of Surface Qualities of Silica Gel From Adsorption and Desorption Measurements. **Bestimmung von Oberflächeneigenschaften des Silicagels aus Adsorptions- und Desorptionsmessungen.** H. W. Kohlschütter and G. Kämpf. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 292, nos. 5-6, Dec. 1957, p. 298-310.

6689* (English.) **Microwave Spectra of Some Molecules Containing -CF_3 and -SiF_3 Groups.** L. F. Thomas, J. S. Heeks, and J. Sheridan. *Zeitschrift für Elektrochemie*, v. 61, no. 8, 1957, p. 935-937.

Microwave spectra were measured for a number of isotopically substituted forms of methyl fluoroform, methyl trifluorosilane, and trifluoromethyl cyanide.

6690* (German.) Fluorescence Spectra, Reflection Spectra, and the Fluorescence Decay Time of Crystalline Molecular Compounds. **Fluoreszenzspektren, Reflexionsspektren und Fluoreszenzabklingzeiten von kristallinen Molekülverbindungen.** J. Czekalla, A. Schmillen, and K. J. Mager. *Zeitschrift für Elektrochemie*, v. 61, no. 8, 1957, p. 1053-1056.

An analysis of the fluorescence and absorption spectra of some solid molecular compounds of hexamethyl benzene, measured at room temperature, shows that the photoluminescence of such crystalline compounds should also be regarded as a charge-transfer fluorescence.

6691* (German.) The Infra-Red Spectrum of Organic Substances in Thin Layers. **Über das infrarote Spektrum organischer Substanzen in dünner Schicht.** Georg Karagounis and Ottokar Peter. *Zeitschrift für Elektrochemie*, v. 61, no. 8, 1957, p. 1094-1100.

Measuring the infra-red spectrum of benzoic acid, *p*-benzoquinone, butynediol, and *p*-chlorophenol on thin layers on AgI. Comparison with the infra-red spectra of the solid substances.

6692* (German.) Infra-Red Absorption and Association of Dialkyl Aluminum Hydrides. **Infrarotabsorption und Assoziation von Dialkyl-Aluminiumhydriden.** E. G. Hoffmann and G. Schomburg. *Zeitschrift für Elektrochemie*, v. 61, no. 8, 1957, p. 1101-1109.

Solution in the pure state and in inert solvents of compounds of the R_2AlH type. Aluminum hydride valence oscillations strongly broadened by association at 5.5μ. Interpretation of the integral absorption.

6693* (German.) Infra-Red Spectroscopic Investigation of Aluminum-Hydrogen Compounds. **Infrarotspektroskopische Untersuchungen an Aluminiumwasserstoffverbindungen.** G. Schomburg and E. G. Hoffmann. *Zeitschrift für Elektrochemie*, v. 61, no. 8, 1957, p. 1110-1117.

6694* (German.) Using High Frequency Titration in Highly Conductive Systems. **Über die Anwendung der Hochfrequenztitration in hochleitenden Systemen.** Kurt Cruse. *Zeitschrift für Elektrochemie*, v. 61, no. 9, 1957, p. 1123-1127.

The range of highly sensitive measurements made at very high frequencies was greatly increased by suitably applying a blank- and active component method. Application to the evaluation of the effect of temperature on the conductivity of highly concentrated soda lyes and to measurements in electrolyte and metal melts. Phase diagrams.

6695* (German.) Kinetics of the Adsorption of Gases in the Proximity of Their Critical Temperature. **Zur Kinetik der Adsorption von Gasen in der Nähe ihrer kritischen Temperatur.** Kurt Peters and Emil Proksch. *Zeitschrift für Elektrochemie*, v. 61, no. 9, 1957, p. 1241-1246.

Investigation of the kinetics of the adsorption and desorption of krypton, methane, ethane, and propane on activated carbon between 30 C below and 30 C above their critical temperatures.

6696* (German.) Structure and Properties of Semimetals. **Über die Struktur und die Eigenschaften der Halbmetalle. XII.** Ring Structure of High Molecular Sulfur. **Zur Ringstruktur des hochmolekularen Schwefels.** H. Krebs. *Zeitschrift für Naturforschung*, v. 12b, no. 12, Dec. 1957, p. 795-802.

Detection of ring structure in melted Se and S by chemical methods. Measurements of the radical concentration by the paramagnetic resonance method. Molecular kinetical interpretation of amorphous and liquid S forms.

6697* (English.) **Stability of Metal Complexes in Solution. I. A Spectrophotometric Study, and Its Application to Ferric-Sulphosalicylic Acid Complexes.** B. N. Mattoo. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 13, nos. 5-6, Dec. 1957, p. 316-326.

A precise and general method of determining stability constants of metal complexes in solution involving stepwise equilibria. An alternative method makes use of the well separated equilibria resulting in various isobestic families of curves.

6698* (German.) Various Orientations of NaBr on PbS and Conversion of NaBr → NaBr·$2H_2O$. **Die vershiedenen Orientierungen von NaBr auf PbS und die Umwandlung von NaBr → NaBr · $2H_2O$.** M. Cocchi and E. Ferroni. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 13, nos. 5-6, Dec. 1957, p. 327-334.

Relationship between a decrease of the free nucleus formation energy and various epitactic (enjoined) orientations of crystals deposited on the donor crystal such as NaBr.

6699* (Russian.) Oscillographic Study of the Kinetics of Electrode Processes Taking Place on Metals Dissolving in Acids. **Ostsillograficheskoe issledovanie kinetiki elektrodnykh protsessov, protekaiushchikh na metallakh, rastvoriaiushchikhsia v kislotakh.** V. I. Kravtsov. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2627-2634.

Examination of the rules governing the potential change of dissolving metals in acids. Derivation of equations for the cases of low and high polarization, and for the oscillograms in the case of change in the current densities.

6700* (Russian.) Theory of the Corpuscular Structure of Absorbents Capillary Condensation and Sorption Hysteresis in the Spaces Between Regularly Packed Spheres. **K teorii korpuskuliarnoi struktury absorbentov. Kapilliarnaia kondensatsiia i sorbtsionnyi gisterezis v zazorakh mezhdu pravil'no upakovannymi sharami.** A. P. Karnaukhov and A. V. Kiselev. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2635-2643.

Theoretical study of capillary condensation in the spaces between regularly packed spheres with the coordination numbers 12, 8, 6, and 4 in the region of relative pressures from 0.2 to 1.0 atm. Capillary condensation in packings of the coordinate number 12, 8, or 6 leads to sorption hysteresis.

6701* (Russian.) Electrical Conductivity of Fused Salts. **Elektroprovodnost' solei v rasplavlennom sostoianii.** V. A. Kochinashvili and V. P. Barzakovskii. *Zhurnal Prikladnoi Khimii*, v. 30, no. 12, Dec. 1957, p. 1755-1759.

Data on the specific electrical conductivity of $BaCl_2$ (up to 1300 C), and of the two-component system: $CaCl_2$-$BaCl_2$ in the range from 700 to 1100 C.

See also: **7216** (chemistry of continuous pickling); **7481** (mass transfer in liquid metal systems); **7605** (fluorescence in organic solutions).

COATINGS

6702 A New Alkyd Resin Emulsion. H. J. West. *American Paint Journal*, v. 42, Mar. 3, 1958, p. 72 + 7 pages.

Characteristics, applications, and formulation.

6703* (Polish.) The Mechanism of Sulfurization of Copper-Zinc Alloys. **Badania Mechanizmu siarkowania stopów miedzi z cynkiem.** Lucjan Czerski, Stanisław Mrowec, and Teodor Werber. *Archiwum Hutnictwa*, v. 2, no. 4, 1957, p. 391-410 + 1 plate.

Kinetics of sulfurization of Cu-Zn alloys with from 1 to 20% Zn in liquid S. With increasing concentrations of Zn in the alloy, the rate of sulfurization decreases.

6704 Protective Linings for Steel Shipping Containers. Louis J. Nowacki. *Corrosion*, v. 14, Feb. 1958, p. 60-62.

Factors affecting lining performance include such matters as metal surface conditions, chemical and physical characteristics of lining, and lining application and curing. Tests for linings and lined containers include product-resistance, coating continuity, lining thickness, reverse-impact resistance, and degree of cure. The types of lining materials available are described.

6705* Electrically Conductive Chromate Surface Conversion Coatings. R. Stricklen. *Electrical Manufacturing*, v. 61, Feb. 1958, p. 106-110.

Non-porous anti-corrosion metal finishes with good structural strength, electrical conductivity, and excellent adhesive properties minimize economics and design problems.

6706 The Selection and Use of Phosphate Coatings as Pre-Treatments for Organic Finishes. II. R. F. Drysdale. *Electroplating and Metal Finishing*, v. 11, Feb. 1958, p. 51-55.

Wetting characteristics; time of treatment; plant considerations; surface cleaning and pre-treatment; surface condition; types of coating processes.

6707* (Czech.) Electrically Heated Baths for Hot-Dip Plating. **Lázně pro ponorové pokovování, vytápěné elektricky.** Karel Janecký. *Hutník*, v. 7, no. 12, Dec. 1957, p. 408-412.

Reasons for use of electricity. Design and description of the electrically heated baths for Sn- and Zn-plating of wires, strips, pipes, and wire products. Dependence of Fe solubility in Zn on time and temperature.

6708 Industrial Baking Enamels. II. E. G. Shur. *Industrial Finishing*, v. 34, Feb. 1958, p. 34 + 4 pages.

Chemical composition and physical qualities of typical informations. (To be concluded.)

6709* Epoxy Ester Coatings for the Metal Litho Industry. Milton A. Glaser, G. K. Hughes, E. J. Bromstead, and K. V. Srabian. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 30, Feb. 1958, p. 132-155.

Properties and preparations; evaluation tests for metal litho coatings; driers and effects of acid value on stratification of Co-drier catalyzed epoxy-esters; effect of varying ratios of epoxy-ester constituents.

6710* A Mathematical Analysis of the Precision in Determining Hiding Power. Parker Mitton. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 30, Feb. 1958, p. 156-182.

Typical standard deviations encountered in measuring the reflectance and the film thickness of paint films on hiding-power charts are discussed and their effect on the precision of hiding-power measurements is computed.

6711* Analytical Spectroscopy in the Protective Coatings Industry. Claude A. Lucchesi. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 30, Feb. 1958, p. 212-230.

Theory and applications of ultra-violet and infra-red spectroscopy, flame photometry, and X-ray fluorescence spectrometry, as they relate to paint chemistry.

6712 Selective Polar Adsorption and Some Rheological Phenomena in Paint Systems. L. Dintenfass. *Oil & Colour Chemists' Association, Journal*, v. 41, Feb. 1958, p. 125-149.

Effect of polar adsorption on dispersion and wetting of pigments and resultant rheological structures. Thixotropy, viscosity, and yield value of paint systems. Effect of dilatancy of the paint vehicle. Viscosity equations relating sedimentation volumes and effective (hydrodynamic) volumes of pigments to the relative viscosity of suspensions. Empirical equations covering rate of thixotropic recovery and time required for mixing.

6713 A New Class of Paint Media Derived From Fatty Acids. M. R. Mills. *Oil & Colour Chemists' Association, Journal*, v. 41, Feb. 1958, p. 165-176.

Preliminary information about a new film-forming material obtained by the catalytic condensation of fatty acids through their carboxyl groups, with evolution of water and CO_2.

6714 Influence of Titanates on Paint Properties. H. W. Chatfield. *Paint Manufacture*, v. 28, Feb. 1958, p. 43 + 5 pages.

Effects of organic titanates on durability, skinning, rivelling, film thickness, stoving properties, and resistance to impact. Effect of ultra-violet light. Use as plasticizers.

6715 Damage to Various Films by Gamma Irradiation. Ichiro Terai. *Paint, Oil & Chemical Review*, v. 121, Jan. 23, 1958, p. 6 + 2 pages.

Discusses factors which are prerequisites for a suitable paint to be used in pile rooms, isotope laboratories, and factories processing atomic fuels.

6716 Some Aspects of the Esterification of Epoxy Resins. R. Martin, J. E. Loible, and R. J. Turner. *Paint Technology*, v. 22, Jan. 1958, p. 7-10.

The esterification reaction; importance of acidity; use of catalysts; viscosity of esters; effect of triphenyl phosphite; styrenation of esters; varnish production.

6717 Modern Colour. *Paint Technology*, v. 22, Jan. 1958, p. 25-26.

A review of recent discoveries and improvements.

6718* Water Sorption of Low Opacity Pigments. Stanley Le Sota. *Paint and Varnish Production*, v. 48, Feb. 1958, p. 31-35.

Method of measuring water sorption depends upon a pigment/water inversion point analogous to the oil/water inversion point used in emulsion technology. A Brabender Plastograph is used to evaluate 16 pigments in vinyl and acrylic latex paints.

6719* Petrochemicals for Paint. I. Chemurgy of Paint and Basic Chemistry of Petrochemicals. *Paint and Varnish Production*, v. 48, Feb. 1958, p. 43 + 6 pages.

6720* Dispersion and Tinting Strength of Iron Oxide. Max Kronstein and Morton Treade. *Paint and Varnish Production*, v. 48, Feb. 1958, p. 50 + 2 pages.

The influence of soybean lecithin on the dispersion and tinting strength properties of iron oxide pigments in an enamel vehicle.

6721* Frictional Electric Charge of a Paint Spray. George E. F. Brewer and Jerry Sevick. *Paint and Varnish Production*, v. 48, Feb. 1958, p. 52 + 3 pages.

A study of variables influencing the observable electric charges of a spray.

6722* Metalizing—What It Is, What It Does—It's Dramatic, Efficient. Robert B. Goodman. *Paper, Film and Foil Converter*, v. 32, Feb. 1958, p. 26-29.

Metalized packaging material combines the reflectivity of foil laminated paper with paper's handling ease. Types of metalizing and metalizing equipment are discussed.

6723 Porcelain Coatings on Steel. L. E. Fussell and H. P. Tripp. *Product Engineering*, v. 29, Feb. 17, 1958, p. 75-77.

Some basic facts on porcelain coating to simplify design. Formation and various methods of coating such as dipping, spraying, electrostatic spraying, and flow coating. New enamels and better process control permit one-coat porcelain for ordinary cold-rolled steel. Lower firing temperatures cut cost.

6724* New Surface Coatings Based on Diisocyanates. M. E. Bailey. *SPE Journal*, v. 14, Feb. 1958, p. 41 + 4 pages.

Properties and applications. Film evaluation procedures.

6725* (German.) Single-Coat White Enamel Applied Directly on Steel. **Einschicht-Weissemails direkt auf Stahl. VI.** On Certain Processes During Firing Titanium White Enamel on Untreated Sheet Metals. **Uber einige Vorgänge beim Einbrennen von Titanweissemails auf nichtpräparierten Blechen.** Armin Petzold and Helmut Betzer. *Sprechsaal*, v. 91, no. 2, Jan. 1958, p. 26-29.

Study of firing phenomena in general and in particular the case of single-coat white enamel on untreated (for instance non-Ni-coated) sheet metals. Data on firing temperatures, firing times, and behavior of the scale (iron oxide appearing between metal and enamel).

6726 Metal Spraying in Inert Atmospheres. R. E. Monroe, D. C. Martin, and C. B. Voldrich. *Welding Journal*, v. 37, Feb. 1958, p. 114-119.

A new and promising method of producing metallic coatings was studied. Zirconium coatings deposited on U by this method were porous and contained many spray particles which were not satisfactorily flattened out during deposition. A diffusion heat treatment after spraying was effective in eliminating the boundaries between individual Zr particles. As-sprayed and heat-treated coatings had good adhesion to U. The development and operation of suitable arc-spray equipment is discussed.

6727 The Effect of Nuclear Radiation on Military Specification Paints. Lloyd A. Horrocks. *Wright Air Development Center Materials Laboratory, WADC Technical Report* 57-186, Nov. 1957, 23 p. (TL507 Un3.18w Vis.)

Reflectance, adhesion, abrasion, humidity, and film condition data are presented on the effects of γ-radiation and heat on silicone-alkyd, fluorocarbon, alkyd, nitrocellulose, phenolic, and epoxy resin-based paints.

See also: **7144** (corrosion resistance of galvanized steel); **7215** (vitreous enamel on oxidized cast iron); **7299** (fatigue of metal-sprayed parts); **7414** (plating thickness tester); **7638** (poly(vinyl fromal)-phenolic wire enamel); **7654** (thermoplastic resins).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

6728 (English.) **An Electronic Computer for Statistical Analysis of Radio Propagation Data.** M. Grønlund and C. O. Lund. *Acta Polytechnica (Applied Mathematics and Computing Machinery Series)*, v. 1, no. 3, 1957, 26 p. + 18 plates. (T1 Ac81 Vis.)

Methods and equipment used. The field strength is usually recorded with pen recorders, and these recordings are transferred into a five digit binary code by a manually operated curve converter. The binary code is stored as perforations on ordinary punched teletype tape.

6729* A Digital Flying Extensometer for Temper Rolling Mills. N. S. Wells. *Applications and Industry*, 1958, no. 34, Jan., p. 376-378.

Design of electronic device which permits continuous observation and recording of strip elongation under all mill running conditions.

6730* The Selection and Use of Servo Performance Criteria. W. C. Schultz and V. C. Rideout. *Applications and Industry*, 1958, no. 34, Jan., p. 383-388.

6731* A Describing Function for the Multiple Nonlinearities Present in 2-Stage Electrohydraulic Control Valves. J. Zaborszky and H. J. Harrington. *Applications and Industry*, 1958, no. 34, Jan., p. 394-401.

6732 Analysis of the Transient Response of Nonlinear Control Systems. P. E. W. Grensted. *ASME, Transactions*, v. 80, Feb. 1958, p. 427-432.

The response of a servomechanism containing marked saturation, back-lash, and coulomb friction is analyzed successfully.

6733 Statistical Treatment of Sampled-Data Control Systems for Actual Random Inputs. Masahiro Mori. *ASME, Transactions*, v. 80, Feb. 1958, p. 444-450.

Fundamental statistical relations of sampled-data systems in terms of the correlation functions of time series, the pulse spectral densities, and the modified z-transform are presented.

6734 Design of a Self-Optimizing Control System. R. E. Kalman. *ASME, Transactions*, v. 80, Feb. 1958, p. 468-478.

Design of a small computer which should find widespread application in the automation of complex systems such as aircraft or chemical processes.

6735* Magnetic Tape Systems for Data Recording. Philip A. Mohr. *Automation*, v. 5, Feb. 1958, p. 72-79.

Contemporary development in magnetic tape-recording equipment. Application, glossary of terms. The digital, FM carrier, pulse width modulation, and direct recording systems are discussed.

6736* Automatic Control of Electroplating. H. Silman and K. M. G. Stewart. *Automation Progress*, v. 3, Feb. 1958, p. 44 + 4 pages.

Development of ingenious transfer and handling devices permitting continuous multiple-operation plating and finishing. The technique combines the chemical type of process control, involving levels, temperature, pH, etc., with the timing and mechanical movement of individual workpieces as in metal-working transfer machines.

6737* Nucleonic Thickness Gauge Controls Brass Rolling Mill. *Automation Progress*, v. 3, Feb. 1958, p. 60-61.

Nuclear gage, fully equipped with feedback control in two modes, acting on the mill screw-down motors, has been installed in industry. Self standardization and safety interlocks are other important features.

6738* Programming Digital Computers. I. J. F. Davison. *British Communications & Electronics*, v. 5, Feb. 1958, p. 88-91.

Input/output; basic parts of a computer; the order code; arithmetical and jump orders; modification and counting; times of operation.

6739 Statistical Design Theory for Strictly Digital Sampled- Data Systems. S. S. L. Chang. *Communication and Electronics*, 1958, no. 34, Jan., p. 702-709.

A synthesis procedure for designing optimum sampled-data systems on a statistical basis.

6740 Kineplex, a Bandwidth-Efficient Binary Transmission System. R. R. Mosier and R. G. Clabaugh. *Communication and Electronics*, 1958, no. 34, Jan., p. 723-728.

A high-capacity phase-shift data-transmission system which will operate in a single standard quality telephone voice band. The system will accept at its input, with suitable conversion, binary data from any source.

6741 The Transformer Analog Computer. P. Venkata Rao and G. Krishna. *Communication and Electronics*, 1958, no. 34, Jan., p. 732-738.

TAC is a very versatile machine capable of solving problems in a.c. networks and linear simultaneous equations with complex coefficients.

6742 Analog Computer Study of Wind-Tunnel Drive. K. G. Black and R. J. Noorda. *Communication and Electronics*, 1958, no. 34, Jan., p. 745-750.

Various components of the drive and control were analyzed and an analog computer representation developed.

6743 Automatic Programming for Business Applications. Grace M. Hopper. *Computers and Automation*, v. 7, Feb. 1958, p. 14-16.

6744* Cryogenic Devices in Logical Circuitry and Storage. J. W. Bremer. *Electrical Manufacturing*, v. 61, Feb. 1958, p. 78-83.

Ability to destroy the superconductivity of certain metallic elements by application of critical magnetic fields at temperatures approaching absolute zero suggests applications of the basic Cryotron to logical circuitry such as binary added stages and memory circuits of miniaturized computers.

6745 Servo Control. Direct Drive Eliminates Blacklash in High Performance Servos. David C. Smith. *Electromechanical Design*, v. 2, no. 1, Jan.-Feb. 1958, p. 24-26.

6746 Reliability Estimation, Prediction and Measurement. Seymour Nozick. *Electromechanical Design*, v. 2, no. 1, Jan.-Feb. 1958, p. 61-64.

Three simple graphs for estimating, predicting, and measuring the reliability of most electronic and electromechanical systems now in the design stage.

6747 Automatic Control of Ground Instrumentation During the Launching and Flight of Experimental Guided Missiles. R. J. Garvey. *Electronic Engineering*, v. 30, Feb. 1958, p. 54-60.

Program switch unit switches control and recording equipment on and off automatically to a pre-arranged program set up for the particular missile. Switching is effected by two uniselectors which control output relays according to time settings on a selector board.

6748 A New Bistable Element Suitable for Use in Digital Computers. I. C. D. Florida. *Electronic Engineering*, v. 30, Feb. 1958, p. 71-77.

Development of a trigger circuit which uses both p-n-p and n-p-n type transistors. It has fast switching speed, high current handling capacity, and low output impedance. (To be continued.)

6749 Checking on Computers, A New Approach to Verification. William C. Meilander. *Electronic Industries*, v. 17, Feb. 1958, p. 62-65.

Point-to-point checking of computer components is prohibitively time consuming. A unique problem analyzer reduces verification time to 40 min.

6750 Word Generator for Digital Testing. Ralph R. Hartel. *Electronics*, v. 31, Feb. 28, 1958, p. 71.

Beam-switching tube supplies arbitrary nine-bit words at pulse rates from a few c.p.s. to one mc. for testing and evaluating digital systems. Pulse shape can be varied from spike to square wave by changing plug-in capacitors.

6751 An Analysis of Certain Errors in Electronic Differential Analyzers. I. Bandwith Limitations. Paul C. Dow, Jr. *Institute of Radio Engineers, Transactions on Electronic Computers*, v. EC-6, Dec. 1957, p. 255-260. (TK1 In6.6e Vis.)

Deals with operational amplifier frequency response, capacitor leakage resistance, and stray capacitance in summing and integrating amplifier circuits.

6752 An Analysis of Coherent Integration and Its Application to Signal Detection. K. S. Miller and R. I. Bernstein. *Institute of Radio Engineers, Transactions on Information Theory*, v. IT-3, Dec. 1957, p. 237-248. (TK1 In6.6it Vis.)

Numerical results appropriate for system design are presented as a series of graphs of missed-signal probability vs. number of integration channels, with initial signal-to-noise ratio and overall false alarm probability as parameters.

6753 Computers in the Process Industries. Theodore J. Williams, R. Curtis Johnson, and Arthur Rose. *Instruments and Automation*, v. 31, Jan. 1958, p. 90-94.

Perspective on the present and future role of computers in the process industries is obtained by a résumé of the applications to date, including the difficulties thus uncovered.

6754 Electric Control-Valve Operators. Glenn F. Brockett. *Instruments and Automation*, v. 31, Jan. 1958, p. 111-116.

A résumé of available and experimental electric-powered control-valve operators, covering the inherent problems, various solutions to these problems, economic factors, and improvements to be expected in future developments.

6755 An Introduction to Automatic Digital Computers. R. K. Livesley. 53 p. 1957. Cambridge University Press, London. (TK7872.C5 L75i)

The elements of programming; input, storage, and output of numbers; organization of programs; solution of engineering problems.

6756 Methods for Determining Transient Response of Servo Systems. II. Transient Response From Transfer Functions. J. M. Nightingale. *Machine Design*, v. 30, Feb. 20, 1958, p. 148-155.

Concepts and principles of approximate methods for analyzing servo response characteristics.

6757* (Dutch.) Partial Automation in the Metal Industry. **De gedeeltelijke automatisering in de metallindustrie.** C. N. van der Velden. *Metalen*, v. 15, no. 1, Jan. 1958, p. 2-5.

Difference between full and partial automation. Gripping and moving by means of hydraulic or pneumatic cylinders. Connecting and switching by means of electronic or pneumatic devices. Transportation. Assembling. Economic considerations.

6758 The Testing and Application of Solenoids for Appliances. I. Gebel and D. O. Myers. *Metal Products Manufacturing*, v. 15, Feb. 1958, p. 27 + 4 pages.

Performance characteristics, selection, test procedures, and proper utilization.

6759 A Data Processing System for Low-Level Signals. *Research & Engineering*, v. 4, Jan.-Feb. 1958, p. 16-18.

"Madis I" is a high-capacity, medium-speed data system consisting of a 675-channel commutator, an electronic analog-to-digital converter, a control and timing unit, a digital tape recorder, and a novel test and monitoring system.

6760* New Single-End Cord Treater—The Computreater. *Rubber World*, v. 137, Feb. 1958, p. 701-710.

A single- or multiple-end cord treater for determining optimum tire cord processing conditions and also useful for continuous supervision of quality control was developed.

6761 Upper Confidence Limits for the Failure Probability of Complex Networks. G. P. Steck. *Sandia Corporation, Research and Development Report (U. S. Atomic Energy Commission)*, SC-4133(TR), Dec. 1957, 39 p. (UF767 Un3.1sc Contin.)

A general method of determining upper confidence limits for the failure probability of any combination of components when the failure history of the individual components is known. The assumptions made are that failures are independent and follow a binomial distribution. The relation between systems of upper confidence limits and operating characteristics curves for acceptance testing by attributes is described.

6762 (German.) Measuring Technique for the Control and Location of Faults in Electrical Installations in Iron Mills. **Die Messtechnik zur Überwachung und Fehlersuche bei elektrischen Anlagen in Hüttenwerken.** Kurt Stahl. *Stahl und Eisen*, v. 78, no. 2, Jan. 23, 1958, p. 94-100.

Routine measurements; built-in measuring instruments; recorders and counters; verification of regulation and control systems; portable measuring devices; oscillograph; location of faults; fault recorders.

6763* (Italian.) Cybernetics and Its Mathematical Bases. **La cibernetica e i suoi fondamenti matematici.** *Tecnica Italiana*, v. 22, no. 8, Dec. 1957, p. 549-560.

The meaning and contents of cybernetics. Information theory. Entropy of the source of information and of a set of messages. The Hatley-Shannon law. The theory of regulation; feed back; dynamic behavior. Stability.

6764* (Norwegian.) Electronic Analog Computers, Construction and Use. **Elektroniske analogregnemaskiners oppbygging og anvendelse.** Tore Hennig. *Teknisk Ukeblad*, v. 105, no. 2, Jan. 9, 1958, p. 21-28.

Surveys principles of construction and operation of current electronic computer components. A synthetic method of drawing analog computer circuit diagrams when the transmission function for the system examined is known.

6765 Surface Modified Nuclear Optical Model: Description of the SUMNUM Code for the NORC Computer. Harvey J. Amster and Linwood M. Culpepper. *Westinghouse Electric Corporation, Bettis Plant (U. S. Atomic Energy Commission)*, WAPD-TM-87, Oct. 1957, 20 p. (UF767 Un3.1wa Contin.)

The SUMNUM code calculates neutron cross sections from potentials with a square well core and an arbitrary function in the surface.

See also: **6429** (process control γ-ray absorptometer); **6825** (transistors in automatic controls); **7019** (automatic regulation of boilers); **7034** (machines for bibliographic control); **7035** (machine translation); **7036** (Russian to English translating machines); **7177** (open-hearth control instruments); **7189** (blast furnace control equipment); **7190** (open-hearth control); **7191** (open-hearth control); **7251** (automatic heat treating); **7327** (controlled flame cutting); **7328** (tape controlled flame cutting); **7331** (automatic control in a strip rolling mill); **7339** (controlled flame cutting); **7446** (digital techniques in reactor control); **7447** (digital techniques in reactor control); **7541** (automation and human factors); **7545** (linear programming computing techniques); **7694** (refrigeration controls); **7709** (pulp processing controls).

ELECTRICAL ENGINEERING

6766* (English.) **On the Thermal Turnover of Germanium Rectifiers.** E. Nagy. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 231-233.

The dependence of turnover voltage on resistivity and mobility is the same as deduced from Zener breakdown.

6767 (English.) **Large Signal Behaviour of Directly Heated Thermistors.** S. Ekelöf, N. Björk, and R. Davidson. *Acta Polytechnica (Electrical Engineering Series)*, v. 7, no. 9, 1957, 31 p. (T1 Ac81 Vis.)

Shows how large amplitude thermistor problems can be handled by methods based on the thermistor or power balance equation, and examines the validity of these methods by comparison with experimental results.

6768 (English.) **The Rationalization in Electromagnetism and Electrostatics.** F. Dahlgren. *Acta Polytechnica (Electrical Engineering Series)*, v. 7, no. 11, 1957, 14 p. (T1 Ac81 Vis.)

Rationalization by quantities is regarded as the only reasonable and logical way of attaining the desired simplification of electromagnetic equations.

6769 (English.) **Electromechanical and Electroacoustical Analogies and Their Use in Computations and Diagrams of Oscillating Systems.** Bent Gehlshøj. *Acta Polytechnica (Electrical Engineering Series)*, v. 8, no. 1, 1957, 143 p. (T1 Ac81 Vis.)

A survey of the principles and application of electrical circuit analogies of mechanical and acoustical oscillating systems.

6770 (English.) **General Physical Laws for the Electrical Filter Ladder.** Torbern Laurent. *Acta Polytechnica (Electrical Engineering Series)*, v. 8, no. 5, 1957, 22 p. (T1 Ac81 Vis.)

A highly selective filter should always be formed as a filter ladder composed solely of series and shunt arms. Such a ladder, containing a minimum of reactive elements and enabling complete energy transmission within the pass band, can always be divided into its series and shunt arms in sections which are image connected to each other.

6771 Flame Proofing Switchgear. J. H. Michael. *Allis-Chalmers Electrical Review*, v. 22, no. 4, 1957, p. 9-11.

Data on new flame-retardant insulations.

6772 (French.) Objective Methods for Measuring the Reference Equivalent and the Attenuation of the Equivalent for Intelligibility in Telephonometry. **Méthodes objectives de mesure de l'équivalent de référence et de l'affaiblissement équivalent de netteté en téléphonométrie.** Pierro Schiaffino. *Annales des Télécommunications*, v. 12, no. 10, Oct. 1957, p. 349-358.

Ratio between the physical amplitude of sound and its effect on the ear as dependent upon the number of nerve fibers excited. Application of Collard's "intelligibility index". Distribution of the instantaneous intensity of human speech.

6773* Germanium Rectifier Equipment for Electrolytic Processes. L. G. Miller and W. R. Hodgson. *Applications and Industry*, 1958, no. 34, Jan., p. 353-357.

Germanium diodes, their construction, operation, and protection along with typical applications for Ge semiconductor rectifiers.

6774* A High-Current-Density Selenium Rectifier. C. C. Geib and W. E. Brown. *Applications and Industry*, 1958, no. 34, Jan., p. 358-360.

Design, characteristics, and applications.

6775 Voltage Conversion With Transistor Switches. P. L. Schmidt. *Bell Laboratories Record*, v. 36, Feb. 1958, p. 60-64.

Inverter circuit using alloy-junction power transistors in conjunction with a special transformer converts a.c. to d.c. with efficiencies up to 90%.

6776 A Numerical-Graphical Method for Synthesizing Switching Circuits. A. H. Scheinman. *Communication and Electronics*, 1958, no. 34, Jan., p. 687-689.

Method consists of the visual comparison of a series of decimal numbers which represent the switching function. Contacts of the switching variables are systematically extracted by the use of simple, easily applied rules.

6777 The Examination of Electric Contacts by the Plastic Replica Method. H. W. Hermance and T. F. Egan. *Communication and Electronics*, 1958, no. 34, Jan., p. 756-762.

6778* (French.) Study and Compensation of the Inhomogeneity of the Magnetic Field of an Electromagnet. **Étude et compensation de l'inhomogénéite du champ magnétique d'un électroaimant.** Henri Bonoit and Michel Sauzade. *Comptes Rendus*, v. 246, no. 4, Jan. 27, 1958, p. 579-582.

Existence of a minimum of the magnetic field in the center of the air gap of an electromagnet. Properties and distribution. Correction of non-homogeneity by four flat coils placed on the poles.

6779* (French.) Plastic Materials in Aeronautical Electrical Equipment. **Les matières plastiques dans l'équipment électrique aéronautique.** G. Fabre. *DOCAERO; Revue Documentaire de la Technique Aeronautique Mondiale*, 1958, no. 48, Jan., p. 53-70.

Resistance of plastic insulation; dielectric strength and losses; effect of voltage and frequency; thermal and hygrometric effects; brittleness point; softening; creep; impact resistance; combustibility; chemical action.

6780* The Limitation of Fault Current, Power and Energy by Cartridge Fuse Links. R. H. Dean. *Electrical Energy*, v. 2, Feb. 1958, p. 48-51.

6781* Evaluation and Applications of Fiber-Insulated Magnet Wire. Harry L. Saums and W. W. Pendleton. *Electrical Manufacturing*, v. 61, Feb. 1958, p. 93-103.

Application areas of various types of magnet wire with fibrous, film, and composite insulation. Materials range from cotton, paper and silk through glass fibers, nylon yarn, and polyester yarn, including asbestos paper and polyester film.

6782* Microwave Properties of Solid Dielectrics Up to 3000 F. D. M. Bowie. *Electrical Manufacturing*, v. 61, Feb. 1958, p. 144 + 4 pages.

Method and apparatus for measuring dielectric constant and loss tangent in the 2000 to 3000 F range. Selected data showing characteristic variations of dielectric properties with temperature.

6783* (Czech.) Magnetic Field of a Conductor Located in a Cylindrical Cavity of a Ferromagnetic Material. **Magnetické pole vodiče umístěného ve válcové dutině ferromagnetického materiálu.** Miloš Štafl. *Elektrotechnický Obzor*, v. 47, no. 1, Jan. 1958, p. 1-4.

Calculation of the magnetic field generated by a current which is asymmetrically located within the cavity. Solution of the problem by means of cylindrical harmonic functions.

6784* (German.) Behavior of Fluorescent Lamps at High Frequencies. **Das Verhalten der Leuchtstofflampen bei höheren Frequenzen.** Ebbe Rohloff. *ETZ, Elektrotechnische Zeitschrift*, v. 10, Ausgabe B, no. 1, Jan. 1958, p. 1-6.

Establishing changes in the electrical behavior of a fluorescent lamp with the application of higher frequencies. Experiments with Osram, 40-W, low-voltage-type HNW 202, and also with widely used lamps. At frequencies near 50 c.p.s., the low-voltage fluorescent lamp exhibits nonlinear current-voltage behavior. Above 500 c.p.s., the fluorescent lamp acts as a resistance and will illuminate in circuits of any resistance.

6785 Printed Circuits on Irregular Surfaces. Earl P. Purpura. *Industrial Photography*, v. 7, Feb. 1958, p. 18-19.

A simple photographic technique for making circuits enabling simultaneous switching of many voltages and signals. A printed circuit drum switch is used.

6786 Electrical Properties of Epoxy Resins. C. F. Pitt, B. P. Barth, and B. E. Godard. *Institute of Radio Engineers, Transactions on Component Parts*, v. CP-4, Dec. 1957, p. 110-113. (TK1 In6.6cp Vis.)

Properties of epoxies, varying in viscosity and reactivity and cured with several types of hardeners.

6787* (French.) High Frequency Heating. Existence of an Undulating Induced Current in Connection With the "Zebra Stripe" Phenomenon. Chauffage par induction H.F. **Existence d'un courant induit ondulé en rapport avec l'effet de "Zébrage".** Louis Abel. *Journal de Physique et le Radium (Suppl.)*, v. 18, no. 12, Dec. 1957, p. 144A-153A.

A new study of the heat distribution on the surfaces of a steel cylinder when heated by induction of $> 10^5$ Hz. Mathematical theory of the beginning of the regular, parallel, circular "stripes" of this distribution. Stabilization of self-amplification.

6788* (English.) **The Attenuation Characteristics of the Coaxial Laminated Cable.** Shigenori Hayashi and Kōji U-O. *Kyoto University, Engineering Research Institute Technical Reports*, v. 7, no. 6, Dec. 1957, p. 115-138.

6789* Fault Location in Feeder Cables. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 84-87.

Methods of testing for localization of faults in buried cables or in other types where visual examination is impossible.

6790 Paramagnetic Effect in Superconductors. V. Resistance Transition of Tin Wires. Hans Meissner. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 668-680.

The resistance of tin wires between 0.15 and 3 mm. in diameter was measured as a function of the current in the transition region to superconductivity.

6791 Measurements on Superconducting Contacts. Hans Meissner. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 686-694.

The contact resistance between crossed wires was measured as a function of the current at various temperatures in the liquid He range.

6792* (English.) **Electrical Properties of $FeTiO_3$-Fe_2O_3 Solid Solution Series.** Yoshikazu Ishikawa. *Physical Society of Japan, Journal*, v. 13, no. 1, Jan. 1958, p. 37-42.

6793* (Norwegian.) Printed Circuits on Ceramic Material. **Trykte kretser på keramisk gods.** Kåre Granli. *Teknisk Ukeblad*, v. 105, no. 6, Feb. 6, 1958, p. 123-125.

Survey of the printed circuit technique. Efficiency and stability. Methods. Advantages of ceramic plate; dielectric properties; thermal qualities; economy.

See also: **6330** (electrical properties of phosphate glasses); **6806** (printed circuits); **7018** (power generation); **7161** (corrosion of underground conduits); **7292** (superconductivity of La and its alloys); **7294** (superconductive Nb); **7427** (selection of nuclear motors); **7634** (dielectric breakdown in polyethylene).

ELECTROCHEMISTRY

6794* Electrolytic Polishing for Metallography. Cornelius Johnson. *AB Metal Digest*, v. 4, Jan. 1958, p. 4 + 10 pages.

Application of electrolytic polishing in metallographic sample preparation.

6795* Electrolytic Polishing of Stainless Steel. P. F. McKinney. *Chemical & Process Engineering*, v. 39, Feb. 1958, p. 59-60.

The stainless-steel article is first jigged and then immersed in a chemical bath and subjected to an electric current; a controlled amount of metal is removed from all surfaces evenly so that shape and design of the article is unaltered.

6796* (English.) **The Static Electrode Potential Behavior of Tantalum and Its Behavior on Anodic Polarization.** E. M. Khairy and M. Kamal Hussein. *Chemical Society of Japan, Bulletin*, v. 30, no. 9, Dec. 1957, p. 944-949.

The electrode potential behavior of Ta is investigated in buffer solutions initially free from the metal ions in the pH range 1-12. Anodic behavior was studied by the repetitive oscillographic method.

6797 Oxidation of an Aluminum-3 Per Cent Magnesium Alloy in the Temperature Range 200°-550°C. W. W. Smeltzer. *Electrochemical Society, Journal*, v. 105, Feb. 1958, p. 67-71.

6798 A Fused Bath for Electrodeposition of Molten Cadmium-Indium Alloy. George L. Schnable and John G. Javes. *Electrochemical Society, Journal*, v. 105, Feb. 1958, p. 84-88.

The bath, from which ellipsoidal beads of molten alloy are plated onto wires used as leads to emitter and collector electrodes of transistors, contains 6% $CdCl_2$, 56% InCl, and 38% $ZnCl_2$ by weight. It is operated at 260 C with W anodes.

6799* (Russian.) Certain General Problems on Electrochemical Kinetics and the Theory of Ion Reactions. **O nekotorykh obshchikh voprosakh elektrokhimicheskoi kinetiki i teorii ionnykh reaktsii.** A. N. Frumkin. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 12, Dec., p. 1429-1438.

Adsorption of gases on hard-metal surface; electrocapillary phenomena and anomalous properties of a thin layer of liquids.

6800 Investigations Into the Electrodeposition of Titanium Metal From Titanium Tetrachloride in Fused Alkali Metal Chloride Systems. J. Burgess, G. T. Brown, and C. W. Roberts. *Journal of Applied Chemistry*, v. 8, Jan. 1958, p. 6-13.

Emphasis is placed on metal quality as determined by hardness values, and the effects of a number of experimental variables were studied both on hardness and on current efficiency and yield. The use of porous diaphragms in the cell, while necessary for high efficiencies, resulted in an irregular contamination of the metal.

6801 Electrochemical Behavior of the Palladium-Hydrogen System. I. Potential-Determining Mechanisms. II. Thermodynamic Considerations. III. Gas-Charged Palladium Alloys. James P. Hoare, Sigmund Schuldiner, and Gilbert W. Castellan. *Journal of Chemical Physics*, v. 28, Jan. 1958, p. 16-24.

6802 The Determination of the Electrical Conductivities of Some Concentrated Electrolyte Solutions Using a Transformer Bridge. Raymond Calvert, John A. Cornelius, Victor S. Griffiths, and D. Irwin Stock. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 47-53.

Solutions of $BaCl_2$, $MgSO_4$, and potassium ferro- and ferricyanides are studied.

6803* (Russian.) Electrode Potentials of Copper, and the Rate of Its Oxidation in Aqueous Nitrate and Sulfate Solutions. **Elektrodnye potentsialy i skorost' okisleniia medi v vodnykh rastvorakh nitratov i sul'fatov.** V. M. Kadek and L. K. Lepin'. *Latvijas PSR Zinātnu Akademija Vestis*, 1957, no. 11, p. 121-127.

The highest initial rate of oxidation is 1.3 to 1.5 mg/dm²/hr. in unsaturated solutions, and 0.2 to 0.4 mg/dm²/hr. in saturated solutions of K_2SO_4 and $NaNO_3$, decreasing afterwards because of inhibition of the cathode process.

6804 (Hungarian.) Data on Anodic Properties of Aluminum. **Adatok az alumínium anódikus sajátságaihoz.** Dezső Dobos and Gyula Székely. *Magyar Kémiai Folyóirat*, v. 63, no. 12, Dec. 1957, p. 329-333.

Dynamic determination of the curve, characterizing the anodic passivity of Al, using a cathode ray oscilloscope. Depassivating current was caused by the reduction of absorbed O_2, alumina, and oxyhydrate film.

6805 Antimony Plating on Steel and Zinc. G. R. Schaer, W. H. Safranek, and C. L. Faust. *Plating*, v. 45, Feb. 1958, p. 139-143.

A method was developed for plating Sb more adherently on steel by pretreating the steel anodically in phosphoric and other acid solutions. Antimony-plated steel was superior to zinc-plated steel in resisting corrosion in salt spray fog and in air saturated with water vapor. No bulky corrosion products were formed on the Sb plate. Very thin Sb immersion coatings on Zn were effective against corrosion.

6806 Production of Printed Circuits: The Photosensitive Resist Method. Werter P. Van Deusen. *Plating*, v. 45, Feb. 1958, p. 151-156.

Typical processing steps used with a photoresist and some of the considerations promoting increased reliability.

6807* (German.) Mechanism of the Electrolytic Deposition and Solution of Solid Metals. **Zum Mechanismus der elektrolytischen Abscheidung und Auflösung fester Metalle. I.** Phenomena Taking Place During the Steady Solution of Silver Electrodes and Velocity of the Reaction. **Vorgänge bei der stationären Auflösung von Silberelektroden und die Geschwindigkeit der Durchtrittsreaktion.** Heinz Gerischer and Ragnar P. Tischer. *Zeitschrift für Elektrochemie*, v. 61, no. 9, 1957, p. 1159-1162.

6808* (German.) Measurements of the Impedance of the Phase Limit in a Germanium Electrolyte. **Messungen der Impedanz der Phasengrenze Germanium-Elektrolyt.** K. Bohnenkamp and H.-J. Engell. *Zeitschrift für Elektrochemie*, v. 61, no. 9, 1957, p. 1184-1196.

6809* (German.) Magnetic Properties and Electron-Microscopic Structure of Electrodeposited Thin Layers of Nickel-Iron Alloys. Ludwig Reimer. *Zeitschrift für Physik*, v. 150, no. 1, 1958, p. 99-105.

6810* (Russian.) Some Problems on the Theory of Electrodeposition of Alloys. **Nekotorye voprosy teorii elektroosazhdeniia splavov. V.** Oscillographic Investigation of the Cathode Potential in Deposition of Alloys of the System: Copper-Zinc, Copper-Lead, and Nickel-Cobalt. **Ostsillograficheskoe issledovanie potentsiala katoda v protsesse osazhdeniia splava (sistemy med'-tsink, med'-svinets i nekel'-kobal't.** Iu. M. Polykarov and K. M. Gorbunova. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2682-2689 + 1 plate.

An oscillographic investigation of changes in cathodic potential with time, depending upon the character of the alloy being formed, whether solid solution or a eutectic type. That fluctuation in potential during precipitation of alloys is caused by the joint evolution of H was verified.

6811* (Russian.) The Effect of Gelatin on the Formation of Electrolytic Copper Deposits. **Vliianie zhelatiny na obrazovanie elektroliticheskikh osadkov medi.** Iu. V. Lyzlov, T. A. Mech'kovskaia, and A. G. Samartsev. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2720-2724 + 2 plates.

Investigation of the electrodeposition of Cu from a sulfate bath in the presence of gelatin or other colloids shows that all cathode surfaces become active when the current density exceeds a certain critical value. When the over-all current strength of the circuit is insufficient to maintain the critical current density over the entire cathode surface, a spontaneous division of the latter into active and inactive sections takes place, the critical current density establishing itself at the active section.

6812* (Russian.) Electroprecipitation of Manganese. **K voprosam elektroosazhdeniia margantsa.** I. V. Ianitskii and B. B. Stul'pinas. *Zhurnal Prikladnoi Khimii*, v. 30, no. 12, Dec. 1957, p. 1776-1781.

The yield of Mn from the electrolyte increases with current density. Addition of selenious acid increases its yield up to 90% at 3 to 4 A/dm² current density. The effect of the selenious acid addition could be explained by the overvoltage of H on Mn containing Se traces.

6813* (Russian.) Gas-Saturation of Water During Electrolysis. **Gazonapolenenie pri elektrolize vody.** A. L. Rotinian and V. M. Aloits. *Zhurnal Prikladnoi Khimii*, v. 30, no. 12, Dec. 1957, p. 1781-1785.

The coefficient of the increase of resistance is determined by the value of the gas-absorption, and has no relation to temperature, electrolyte composition, or cathode material. Gas-adsorption increases with current density, decreases with increased temperature, and depends also on the cathode material.

6814* (Russian.) Electrochemical Oxidation of Chromium Sulfate. **Elektrokhimicheskoe okislenie sul'fata khroma.** B. I. Tomilov. *Zhurnal Prikladnoi Khimii*, v. 30, no. 12, Dec. 1957, p. 1785-1790.

Purification of dye-wastes by electro-oxidation of the Cr^{3+} in concentrated solutions of sodium chromate alum. Usefulness of electrochemical regeneration of the bichromate from industrial acid filtrates containing chromium sulfate and H_2SO_4 is shown.

See also: **6736** (control of electroplating); **7159** (electrochemical metal protection); **7166** (accelerated corrosion testing of Cr plate); **7199** (Ge by sulfuric acid electrolysis).

ELECTRONICS

6815* (German.) The Electron Conductivity in Crystals With Non-Metallic Bonds. **Zur Elektronenleitung in Kristallen ohne metallische Bindung.** R. W. Pohl. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 3-4.

Electron conductivity, caused by optical and thermal excitation, originates in all crystals with non-metallic bonds if the spacing in the crystals exceeds the 0.5 value.

6816* (German.) Determination of the Concentration and the Mobility of Carriers in Mixed Semiconductors. **Über die Bestimmung der Konzentration und der Beweglichkeit der Ladungsträger in gemischten Halbleitern.** L. Gombay, J. Gyulai, and J. Láng. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 203-209.

A new method of determining the concentration and mobility of electrons by measuring the light conductivity, the Hall constant, the thermoelectric force, and the resistivity change occurring in a transverse magnetic field.

6817* (English.) **Electrical Properties of Electroluminescent SiC Crystals.** E. Nagy and J. Weiszburg. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 235-239.

The current-voltage characteristics of SiC point contacts are the same as for the reverse current of an exhaustion layer rectifier, with a barrier reduced by image force. Surface deterioration produces a conducting layer, which determines the contact behavior for low voltages.

6818 (English.) **A New Table of the Amplitude Functions of the Iterated Sine- and Cosine-Integrals and Some Comments on the Aperiodic Functions in Hallen's Antenna Theory.** P.-O. Brundell. *Acta Polytechnica (Electrical Engineering Series)*, v. 7, no. 10, 1957, 14 p. (T1 Ac81 Vis.)

6819 (English.) **A Sound Spectrometer for Speech Analysis.** Hans Sund. *Acta Polytechnica (Electrical Engineering Series)*, v. 8, no. 4, 1957, 66 p. (T1 Ac81 Vis.)

Audio-frequency sound spectrometer is primarily intended for continuous analysis of connected speech, which is portrayed by photographic recording of visible speech diagrams and instantaneous amplitude spectra.

6820* (English.) **Polarization-Transforming Plane Reflector for Microwaves.** John Aagesen. *Acta Polytechnica (Electrical Engineering Series)*, v. 8, no. 7, 1957, 27 p. (T1 Ac81 Vis.)

A theoretical examination of the field reflected from an infinite plane reflector consisting of a perfectly conducting surface, in front of which is spaced an anisotropically conducting surface which is parallel to the former surface. The anisotropic surface is assumed to have infinite surface conductivity in one direction and zero conductivity in the perpendicular direction.

6821 Spherical Waves Coupled to a One-Dimensional Wave Guide. J. E. White. *Acoustical Society of America, Journal*, v. 30, Jan. 1958, p. 65-68.

An approximate expression is derived for the disturbance in a one-dimensional wave guide resulting from an expanding spherical wave which is loosely coupled to the wave guide at all points along its length.

6822* (German.) Measurement of Low Reflection Coefficients at High Frequencies in Terms of Magnitude and Phase. **Messung kleiner Reflexionsfaktoren bei hohen Frequenzen nach Betrag und Phase.** Adolf Linnebach. *Archiv der Elektrischen Übertragung*, v. 11, no. 12, Dec. 1957, p. 471-477.

No special measuring instruments are employed apart from a directional coupler and a measuring quadripole of simple layout with variable stubs.

6823* (German.) Measuring the Working Temperature of Transistors. **Zur Messung der Betriebstemperatur von Transistoren.** Heinz Beneking. *Archiv der Elektrischen Übertragung*, v. 11, no. 12, Dec. 1957, p. 504-508.

Improvement of sensitivity. Measurement based on the collector current flowing with a short-circuit of the emitter and base terminals. Use of the measuring instrument in relation to Ohm's law of thermal conduction.

6824* High Power Transistor Audio Amplifiers. Marvin B. Herscher. *Audio Engineering Society, Journal*, v. 6, Jan. 1958, p. 42-48.

Design principles for 45-watt amplifiers using a ribbon chassis for cooling and operating over an ambient temperature range of −10 to +50 C.

6825* Applying Transistors. James R. Walker. *Automation*, v. 5, Feb. 1958, p. 84-90.

Describes several successful industrial applications of transistors in automatic control devices.

6826 Designing for the Nuclear Environment. John W. Clarke. *Aviation Age*, v. 28, Feb. 1958, p. 95-99.

Some "rules of thumb" helpful in improving performance of electronic equipment under nuclear radiation.

6827 Electrical Breakdown in p-n Junctions. A. G. Chynoweth. *Bell Laboratories Record*, v. 36, Feb. 1958, p. 47-51.

Mechanism of breakdown phenomenon in Si crystals.

6828* Impedance Bridges. J. F. Golding. *British Communications & Electronics*, v. 5, Feb. 1958, p. 104-109.

Various types of impedance bridges and their applications.

6829* The Calculation of Characteristic Impedance by Conformal Transformation. J. C. Anderson. *British Institution of Radio Engineers, Journal*, v. 18, Jan. 1958, p. 49-54.

Basic theory. Application to the case of a coaxial transmission line with a cylindrical outer and a strip inner. Higher characteristic impedance is achieved this way than with the normal coaxial construction employing cylindrical wire as an inner.

6830* Modern Regional Broadcast Transmitters. W. Klein. *Brown Boveri Review*, v. 44, no. 10, Oct. 1957, p. 416-420.

Design and special advantages of a 25-kw. medium-wave broadcast transmitter.

6831* Combination Frequencies and Cross-Talk in Transmitters for Class C Operation. L. Leng. *Brown Boveri Review*, v. 44, no. 10, Oct. 1957, p. 433-437.

6832* Television Transmitters. V. Milliquet. *Brown Boveri Review*, v. 44, no. 10, Oct. 1957, p. 438-446.

Design of a 1.5 kw. television transmitter and a 300-w sound transmitter for band III.

6833* (Russian.) Calculation of the Electrical Conductivity of a Semiconductor With High Impurity Concentration. **Raschet elektroprovodnosti poluprovodnika s vysokoi kontsentratsiei primesi.** R. Zigenlaub. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 395-398.

6834* (Russian.) The Mobility of Electrons and Holes in a Liquid Semiconductor. **O podvizhnosti elektronov i dyrok v zhidkom poluprovodnike.** I. Z. Fisher. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 399-402.

6835 Junction Transistor Sawtooth Waveform Generators. K. P. Padmanabhan Nambiar. *Electronic Engineering*, v. 30, Feb. 1958, p. 61-65.

Sufficient current swing can be obtained for applications such as electromagnetic scanning of miniature television camera tubes using currently available low power transistors.

6836 A Conductivity Storage Transistor Pulse Width Modulator. J. C. Price. *Electronic Engineering*, v. 30, Feb. 1958, p. 88-90.

6837* Electronic Engineer's Reference Book. L. E. C. Hughes, editor. 1311 p. 1958. Heywood & Co., Ltd., London. (TK7825 H87e Ref.)

A comprehensive compilation of articles on fundamentals, radiations, electricity, valves, materials, vibrations, computers, automation, and miscellaneous other subjects.

6838 A Transistor Tester for the Experimental Lab. Roy A. Hempel. *Electronic Industries*, v. 17, Feb. 1958, p. 58-61.

A completely self-contained instrument with a built-in oscillator and meter, able to check transistors from 1 KC to 1 MC.

6839 Protecting Power Transistors From Thermal Runaway. Paul Penfield, Jr. *Electronic Industries*, v. 17, Feb. 1958, p. 79 + 2 pages.

The designer of power transistor stages must minimize each factor in the crucial term to prevent runaway.

6840* Foster-Seeley Discriminator. C. G. Mayo and J. W. Head. *Electronic & Radio Engineer*, v. 35, Feb. 1958, p. 44-51.

Analysis of a circuit which is essentially a parallel-tuned circuit and an impedance inverter where the frequency variation is linearly converted into amplitude variation.

6841* Coaxial Transmission Lines. S. Mahapatra. *Electronic & Radio Engineer*, v. 35, Feb. 1958, p. 63-67.

Effect of elliptical inner conductor on H.F. characteristics.

6842* Transistor Cut-Off Frequency. Variation With Collector Voltage. W. L. Stephenson. *Electronic & Radio Engineer*, v. 35, Feb. 1958, p. 69-71.

Variation of cut-off frequency with collector voltage is calculated which permits the early feedback factor to be measured in terms of cut-off frequency and collector voltage.

6843 Integrator-Amplifier for Core Measurements. Charles E. Goodell. *Electronics*, v. 31, Feb. 14, 1958, p. 110-113.

Miller-type integrator, in conjunction with 80 db. amplifier provides quick and easy grading and matching of magnetic cores.

6844 Crystal Oscillator Has Variable Frequency. G. A. Gedney and G. M. Davidson. *Electronics*, v. 31, Feb. 14, 1958, p. 118-119.

Two-stage crystal feedback amplifier operates at 9.1 kc. with long-term frequency stability of a few p.p.m. Operating frequency can be pulled off resonance by adjustment of trimmer capacitor in series with crystal. Applications include constant-frequency power source for gyroscopic precision integrator and regulated carrier frequency for electrical resolvers, industrial generators, and phase computing networks.

6845 Designing Stability Into Transistor Circuits. Stanley Schenkerman. *Electronics*, v. 31, Feb. 14, 1958, p. 122 + 1 page.

Chart and nomographs simplify calculation of transistor circuit and cooling-facility parameters necessary for stable operation at elevated junction temperatures. Design information is applicable to both Ge and Si transistor circuits.

6846 D-C Transistor Amplifier for High-Impedance Input. Donald Schuster. *Electronics*, v. 31, Feb. 28, 1958, p. 64-65.

Temperature compensated circuit incorporating double emitter follower and grounded-emitter amplifier provides high-impedance input and stable high-gain output.

6847 Electronic Clock Reads Related Time-of-Events. R. Winfield, D. H. Andrews, and M. Turntine, Jr. *Electronics*, v. 31, Feb. 28, 1958, p. 74-77.

Instrument counts time while indicating absolute time of occurrence of a particular event or series of events.

6848 Designing Transformers for Blocking Oscillators. R. D. McCartney. *Electronics*, v. 31, Feb. 28, 1958, p. 78-80.

Design data for blocking-oscillator transformers is obtained by using four common circuits with three tube types.

6849* (Russian.) Some Possibilities for Utilization of Diffusion Capacitance of Semiconductor Devices. **O nekotorykh vozmozhnostiakh ispol'zovaniia diffuzionnoi emkosti poluprovodnikovykh priborov.** B. L. Kozlov. *Elektrosviaz'*, v. 12, Jan. 1958, p. 22-25.

Utilization of the diffusion capacitance in oscillatory systems and possibility of its application in other regions. Some practical results in automatic frequency control system of heterodyne and in amplifier cell are given.

6850 Radiatin Effects on the G-E Ceramic Vacuum Triode. J. Crittenden. *General Electric, Atomic Products Division (U. S. Atomic Energy Commission)*, APEX-347, Jan. 1958, 10 p. (UF767 Un3.1ap Contin.)

6851 Ghost Modes in Imperfect Waveguides. E. T. Jaynes *I.R.E., Proceedings*, v. 46, Feb. 1958, p. 416-418.

Attention is called to the existence of microwave resonances which have the unusual property that they are nonradiating, and thus have high Q, in spite of the fact that the fields are not enclosed completely by metallic walls. These "ghost modes" represent fields which are derived from those of the usual waveguide modes, but are "trapped" in the vicinity of imperfections in the waveguide. Their resonant frequency is slightly lower than the corresponding cutoff frequency.

6852 High-Frequency Crystal Filter Design Techniques and Applications. David I. Kosowsky. *I.R.E., Proceedings*, v. 46, Feb. 1958, p. 419-429.

New design techniques and simplified circuitry for production of H.F. crystal filters with bandwidths ranging from one cycle to several hundred kc. per sec. The filter components are characterized by high Q and stability under extreme environmental conditions.

6853 Experimental 8-MM Klystron Power Amplifiers. T. J. Bridges and H. J. Curnow. *I.R.E., Proceedings*, v. 46, Feb. 1958, p. 430-432.

Klystron amplifiers were used to investigate the cw power obtainable at a wavelength of 8 mm. Working at 5000 volts with a beam current of 0.2 amp., these tubes produced an output power of 75 watts cw. Operation was limited by the maximum current density of 1.5 amp./cm^2 which could be drawn from sprayed-oxide cathodes.

6854 A High-Power Periodically Focused Traveling-Wave Tube. O. T. Purl, J. R. Anderson, and G. R. Brewer. *I.R.E., Proceedings*, v. 46, Feb. 1958, p. 441-448.

Design considerations, construction, and performance of an S-band, pulsed, kilowatt-level traveling-wave tube, focused by means of periodic permanent magnets. Results of studies on the electron beam defocusing effect of strong R.F. fields and on the effect of attenuator design on power build-up and saturation level. Factors affecting the design of a high-power traveling-wave tube using periodic magnetic focusing.

6855 Measurement of the Radar Cross Section of a Man. F. V. Schultz, R. C. Burgener, and S. King. *I.R.E., Proceedings*, v. 46, Feb. 1958, p. 476-481.

Both the monostatic and the bistatic radar cross sections of a man were measured at the five frequencies 410, 1120, 2890, 4800, and 9375 mc. The measurements were made using both horizontal and vertical polarizations, and for various directions of facing or aspects of the man used as a target.

6856 Theory of Networks of Linearly Variable Resistances. Harold Levenstein. *I.R.E., Proceedings*, v. 46, Feb. 1958, p. 486-493.

A network theory is derived for circuits constructed of linear rheostats driven from a common input shaft. A correspondence between these networks and RL networks is used to demonstrate that driving point impedances and transfer functions are real rational fractions in a real variable, the input shaft rotation. Methods for developing functions approximating a given input-output relation in physically realizable form are discussed.

6857 The Design of Airborne Doppler Velocity Measuring Systems. F. B. Berger. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-4, Dec. 1957, p. 157-175. (TK1 In6.6a Vis.)

6858 A Transistorized Decade Amplifier for Low-Level Audio-Frequency Applications. Alexander B. Bereskin. *Institute of Radio Engineers, Transactions on Audio*, v. AU-5, Sept.-Oct. 1957, p. 138-142. (TK1 In6.6au Vis.)

6859 Design Considerations of a Developmental UHF Tuner Using an RF Amplifier. J. B. Quirk. *Institute of Radio Engineers, Transactions on Broadcast and Television Receivers*, v. BTR-4, Feb. 1958, p. 5-11. (TK1 In6.6b Vis.)

6860 Deflection Distortions Contributed by the Principal Field of a Ring Deflection Yoke. Richard B. Gethmann. *Institute of Radio Engineers, Transactions on Broadcast and Television Receivers*, v. BTR-4, Feb. 1958, p. 24-34. (TK1 In6.6b Vis.)

Equations for the magnetic field of the ring yoke are obtained as solutions of the Laplace differential equation. The paths of axial and para-axial rays through this field are then calculated for the principal field of the ring yoke. Three types of distortions are shown to be contributed by this field.

6861 The Limits of Gain Attainable in Three-Terminal RC Networks With Two Capacitors. I. Cederbaum. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-4, Dec. 1957, p. 298-306. (TK1 In6.6c Vis.)

6862 Recent Advances in Luminescence (Cathodoluminescence and Electroluminescence). Henry F. Ivey. *Institute of Radio Engineers, Transactions on Component Parts*, v. CP-4, Dec. 1957, p. 114-129. (TK1 In6.6cp Vis.)

Included are discussions of transparent phosphor films for "flat" cathode-ray tubes and other purposes, solid-state image display devices, and solid-state radiation converters and amplifiers.

6863 The Status of Microwave Applications of Ferrites and Semiconductors. Benjamin Lax. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-6, Jan. 1958, p. 5-18. (TK1 In6.6mt Vis.)

Review of developments in the field of ferrite devices. Design considerations and achievements of broad banding; fundamental principles leading to the applications of non-linear properties of ferrites. Construction of frequency doublers, mixers, and ferromagnetic resonance amplifiers. Although no significant new semiconductor devices have been developed at microwave frequencies, possibilities are considered for doing this with use of cyclotron resonance and spin resonance phenomena and their related properties in semiconductors.

6864 Nonreciprocal Electromagnetic Wave Propagation in Ionized Gaseous Media. L. Goldstein. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MIT-6, Jan. 1958, p. 19-29. (TK1 In6.6mt Vis.)

Experimental observations. The classical Faraday experiment in the optics of anisotropic media has suggested an analogous phenomenon at microwave frequencies. The anisotropic behavior of the free electron gas which is immersed in a magnetic field and subjected to an incident electromagnetic wave was determined. Guided microwave experiments confirm the theoretical predictions of nonreciprocal wave propagation in such ionized gases.

6865 A Ferrite Boundary-Value Problem in a Rectangular Waveguide. C. B. Sharpe and D. S. Heim. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-6, Jan. 1958, p. 42-46. (TK1 In6.6mt Vis.)

A solution is obtained for the electric field at the air-ferrite interface ($z=0$) in a rectangular waveguide, filled with ferrite in the semi-infinite half ($z>0$) and magnetized in the direction of the electric field. The field is expressed in terms of a Neumann series obtained by iteration of a singular integral equation which satisfies the boundary conditions at the interface. The equivalent circuit for the junction is presented.

6866 Some Techniques of Microwave Generation and Amplification Using Electron Spin States in Solids. D. I. Bolef and P. F. Chester. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-6, Jan. 1958, p. 47-52. (TK1 In6.6mt Vis.)

Possible modes of operation of two-level solid state masers utilizing the techniques of population inversion used in nuclear magnetic resonance. Methods of continuous operation of two-level masers and their usefulness as microwave generators.

6867 Resonance Measurements on Nickel-Cobalt Ferrites as a Function of Temperature and on Nickel Ferrite-Aluminates. J. E. Pippin and C. L. Hogan. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-6, Jan. 1958, p. 77-82. (TK1 In6.6mt Vis.)

6868 Space Exploration—The New Challenge to the Electronics Industry. Henry E. Prew. *Institute of Radio Engineers, Transactions on Military Electronics*, v. MIL-1, Dec. 1957, p. 43-48. (TK1 In6.6mi Vis.)

Examination of the general problem of development of vehicle instrumentation and Earth-based control facilities. Discussion on an approach to solving this problem, based upon a closed control loop concept using radio data links.

6869 A Theoretical Study of Errors in Radio Interferometer Type Measurements Attributable to Inhomogeneities of the Medium. Gustavus J. Simmons. *Institute of Radio Engineers, Transactions on Telemetry and Remote Control*, v. TRC-3, Dec. 1957, p. 2-5. (TK1 In6.6r Vis.)

Effects of variation of the index of refraction of the earth's atmosphere on the angular information yielded by radio interferometers for terrestrial and near-terrestrial sources are investigated, and a second-order correction is derived.

6870 Telemetry Standards for Guided Missiles. *Institute of Radio Engineers, Transactions on Telemetry and Remote Control*, v. TRC-3, Dec. 1957, p. 14-18. (TK1 In6.6r Vis.)

6871 Influence of Wall Losses on Pulse Propagation in Wave Guides. Ryszard Gajewski. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 22-24.

6872 Analysis of the Effect of Nuclear Radiation on Transistors. J. J. Loferski. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 35-40.

The behavior of Ge transistors in nuclear radiation fields is predicted by combining transistor theory and the experimentally observed changes in irradiated semiconductors.

6873 Propagation of Waves in Helical Wave Guides. Chiao-Min Chu. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 88-99.

6874* (French.) Modulation of Direct Currents by Transistor Switch. **La modulation des courants continus par interrupteur a transistors.** J. L. Leroy and C. Mabboux. *Journal de Physique et le Radium (Suppl.)*, v. 18, no. 12, Dec. 1957, p. 135A-136A.

A two-transistor switch can modulate, before their amplification, direct or slowly variable signals down to a few microvolts at the impedance of 30 ohms. The carrier is given by a transistor multibrator supplied with a 4.5 volt battery.

6875* An X-Ray Image Intensifier of the Closed Circuit Television Type. Arthur F. Wegener. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 16 + 5 pages.

Brief review of four basic types of image intensifiers; principles and application of the closed circuit TV type. Use in fluoroscopy and in nondestructive testing.

6876* (German.) The Power Level Control in Transmitters for the Instrument Landing System (ILS). **Die Leistungsregler in den Sendern des Instrumenten-Landesystems (ILS).** Karl May. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, no. 12, Dec. 1957, p. 612-616.

The transmitters for the ILS the approach course and glide path are fitted with power level controls which permit adjustment of the energy for the center antennas (carrier and sidebands) of the approach course transmitter and for the sideband antennas of the glide path transmitter.

6877* (German.) The Frequency Response of Cut-Off Attenuators With Coaxial Launching and Pick-Up Probes. **Der Frequenzgang von Hohlrohr-Spannungsteilern mit koaxialem Geber und Fänger.** Arnold Sander. *NTZ; Nachrichtentechnische Zeitschrift*, v. 11, no. 1, Jan. 1958, p. 1-5.

The frequency response of capacitor coupled cut-off attenuators, types I and II, is calculated. The attenuation ratio is independent of wavelength in the first case and proportional to wavelength in the second case.

6878* (German.) Generation and Amplification of Millimetric Waves. **Die Erzeugung und Verstärkung von Millimeterwellen. I.** W. Kleen and K. Pöschl. *NTZ; Nachrichtentechnische Zeitschrift*, v. 11, no. 1, Jan. 1958, p. 8-19.

Summary of methods for generating and amplifying millimetric waves. A wavelength of approximately 0.6 mm. was obtained by frequency multiplication with crystal diodes. Retarding field valves, reflex klystrons, double slot oscillators, backward wave oscillators and multi-slot magnetrons are suitable generator components.

6879 Isotropic Approximation to the Magnetoresistance of a Multivalley Semiconductor. Robert W. Keyes. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 43-46.

The magnetoconductivity tensor for a single valley is averaged over all orientations of the valley, giving an isotropic magnetoconductivity tensor which should describe the above phenomena.

6880 Emission Mechanism of Cold-Cathode Ares. K. G. Hernqvist. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 636-646.

A new theory is proposed in which excited atoms play a predominant role as a source for ion generation in the vicinity of the cathode surface. The processes of resonance ionization of excited atoms at the cathode surface and of ionization of excited atoms in the strong electric field at the cathode surface are considered.

6881 Intrinsic Optical Absorption in Germanium-Silicon Alloys. Rubin Braunstein, Arnold R. Moore, and Frank Herman. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 695-710.

The intrinsic optical absorption spectrum was measured as a function of temperature and composition. Over the entire composition range the absorption near the threshold ($K<100$ cm^{-1}) exhibits a temperature dependence which is characteristic of phonon-assisted indirect electronic transitions.

6882 Electronic Energy Bands in ZnS: Potential in Zincblende and Wurtzite. Joseph L. Birman. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 810-817.

Calculation of the crystal potential in ZnS. Experimental evidence relating to the nature of the chemical bond indicates that the bonding is a mixture of covalent and ionic with effective charges of $+\frac{1}{2}$ for Zn, $-\frac{1}{2}$ for S. Radially symmetric sp^3 valence electron densities are constructed for each ion and normalized within each equivalent volume sphere to the appropriate net ion charge.

6883* (Russian.) Contactless Relay Using a Crystal Triode. **Beskontaktnoe rele peremeshcheniia na kristallicheskikh triodakh.** N. V. Rozanov and M. G. Chinaev. *Priborostroenie*, 1957, no. 12, Dec., p. 9-11.

Theoretical design of several principle schemes of oscillators with a crystal triode.

6884 Transistor Locator Finds Metal Fast. Edwin Bohr. *Radio-Electronics*, v. 29, Mar. 1958, p. 62 + 3 pages.

Beat-frequency locators have a single exploration loop forming the inductive part of an oscillator circuit. Metals brought within the loop's field cause the oscillator frequency to change.

6885* (Russian.) Transition Processes in the System: "High-Frequency Amplifier-Detector". **Perekhodnye protsessy v sisteme "usilitel' vysokoi chastoty-detektor".** L. S. Gutkin and O. S. Chentsova. *Radiotekhnika*, v. 12, no. 11, Nov. 1957, p. 50-61.

Investigation of transition processes for various types of amplifier circuits, including the tuned-resonant, detuned-resonant, and coupled types. Analysis was carried out by the method of L.F. equivalents.

6886* (Russian.) The Direct Current Semiconductor-Transformer. **Poluprovodnikovyi preobrazovatel' postoiannogo toka.** G. S. Tsykin. *Radiotekhnika*, v. 12, no. 12, Dec. 1957, p. 56-62.

Transformation of d.c. of one voltage into the d.c. of a different voltage for electron equipment is discussed. A powerful transformer with semiconductor triodes is outlined.

6887 Transistor Heat Sinks. Paul Penfield, Jr. *Radio & Television News*, v. 59, Mar. 1958, p. 70 + 3 pages.

Thermal resistance calculations and some practical suggestions for experimenters using power transistors.

6888 Solid State Physical Electronics. Aldert van der Ziel. 604 p. 1957. Prentice-Hall, Englewood Cliffs, N. J. (QC721 V28s)

A comprehensive introduction to the physics of solid state devices that are used or being developed for use in the electronics industry.

6889* (Norweigan.) An Electronic Correlator and Some of Its Applications. **En elektronisk korrelator og noen av dens anvendelser.** Finn Bryn. *Teknisk Ukeblad*, v. 105, no. 3, Jan. 16, 1958, p. 41-46.

Autocorrelation and cross correlation functions are defined. An electronic analog computer for calculating correlation functions is described.

6890 Transistor Circuits. Rufus P. Turner. 160 p. 1957. Gernsback Library, Inc., New York. (TK7872.T73 T85t)

A collection of practical transistor circuits covering a wide range of interests.

6891* Pulse-Type Frequency Measurement. J. C. Muller. *Wireless World*, v. 64, Feb. 1958, p. 83-85.

Apparatus for checking crystal oscillators.

6892 Reusable Seals for Electronic Equipment. William Brown and A. Razdow. *Wright Air Development Center, WADC Technical Report* 56-616, May 1957, 86 p. (TL507 Un3.18w Vis.)

Investigation, evaluation, and establishment of the most effective type of reusable seals for airborne electronic equipment. Fused seals, methods, and procedures were developed for hermetically sealed enclosures of electronic assemblies, subassemblies, and equipment, so they can be opened 15 times for repair and resealed without destroying the contents there-in.

6893* (English.) **Mobility of Electrons in Nondegenerate Semiconductors Considering Electron-Electron Scattering.** M. S. Sodha and P. C. Eastman. *Zeitschrift für Physik*, v. 150, no. 2, 1958, p. 242-246.

See also: **6193** (interplanetary communications and navigation); **6344** (ceramic materials for electronics); **6728** (analysis of radio propagation data); **6975** (low noise converter); **6980** (propagation of V.L.F. radio waves); **6981** (auroral radio reflections); **7004** (electronic print timer); **7575** (electronic lenses); **7599** (solid state Maser amplifier).

ENGINEERING ECONOMICS

6894* Bibliography of Iron Ore Resources of the World (to January 1955). Gwendolyn W. Luttrell. 371 p. 1957. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (Z6738.I75 U3.3b Ref.)

Lists 2732 references.

6895* Review of Canada's Mineral Industry—1957. *Canadian Mining Journal*, v. 79, Feb. 1958, p. 87-194.

A series of articles relating activities of the industry, considering individual provinces, specific minerals, field activities, exploration, mining and milling, and pertinent data from other parts of the world.

6896* Monthly Survey of Energy Resources. II. Solar- and Wind-Energy. *Electrical Energy*, v. 2, Feb. 1958, p. 54-57.

A brief evaluation of the world's solar- and wind-energy resources and their economic potential.

6897 Mineral Commodities of California. Geologic Occurrence, Economic Development and Utilization of the State's Mineral Resources. Lauren A. Wright, editor. 736 p. 1957. State of California, Department of Natural Resources, San Francisco. (TN21 C12b Vis.)

6898 Oil and Gas Developments in Pennsylvania in 1956. William S. Lytle. *Pennsylvania. Department of Internal Affairs Progress Report No.* 151, Apr. 1957, 33 p. + 1 plate. (TN21 P39p Contin.)

6899 Railways and Steel. 63 p. 1957. Steel, Engineering and Housing Section, Economic Commission for Europe. (HE1021 Un2.2r)

Production of railway material and rolling stock. Factors affecting demand for steel by European railways. Official programs in the railway field. Overseas export prospects.

6900 Competition in the Field Market for Natural Gas. Leslie Cookenboo, Jr. *Rice Institute Pamphlet*, v. 44, Jan. 1958, 125 p. (AS36 R36p Vis.)

Growth of the natural gas market; history of field prices; market structure; other factors affecting competition in gas production.

6901* (Norwegian.) World's Sulfur Supply, Now in the Future. **Verdens svovelforsyning-nu og i fremtiden.** Georg M. Lie. *Teknisk Ukeblad*, v. 104, no. 48, Dec. 26, 1957, p. 1083-1092.

Different sources of S, iron pyrites, calcium sulfate, coal, mineral oil, natural gas, and metal sulfides are evaluated.

6902 Petroleum Refineries, Including Cracking Plants in the United States, January 1, 1957. J. G. Kirby. *U. S. Bureau of Mines, Information Circular* 7815, Dec. 1957, 13 p. (TN21 Un3i)

Summary of the crude-oil capacity and the cracked gasoline capacity of the U.S.A., giving statistics on individual plants.

See also: **6973** (uranium resources).

FLUID MECHANICS

6903 Flow Visualization. A. M. Lippisch. *Aeronautical Engineering Review*, v. 17, Feb. 1958, p. 24 + 9 pages.

Two-dimensional smoke tunnel; testing methods; flow visualization of three-dimensional flow patterns; three-dimensional tunnel for flow observation.

6904* Turbulent Heat Transfer in the Thermal Entrance Region of a Pipe With Uniform Heat Flux. E. M. Sparrow, T. M. Hallman, and R. Siegel. *Applied Scientific Research*, v. 7, sec. A, no. 1, 1957, p. 37-52.

The fluid is assumed to have a fully developed turbulent velocity profile throughout the length of the pipe. Local and fully developed Nusselt numbers are presented for fluids with Prandtl numbers ranging from 0.7 to 100 for Reynolds numbers between 50,000 and 500,000.

6905* Measurements of the Intensity, Integral Scale and Microscale of Turbulence Downstream of Three Grids in a Stream of Air. B. G. Van der Hegge Zijnen. *Applied Scientific Research*, v. 7, sec. A, nos. 2-3, 1958, p. 149-174.

6906* Analysis of Heat-Driven Oscillations of Gas Flows. III. Characteristic Equation for Flame-Driven Oscillations of the Organ-Pipe Type. H. J. Merk. *Applied Scientific Research*, v. 7, sec. A, nos. 2-3, 1958, p. 175-204.

6907* Heat Transfer From Horizontal Cylinders to a Turbulent Air Flow. B. G. van der Hegge Zijnen. *Applied Scientific Research*, v. 7, sec. A, nos. 2-3, 1958, p. 205-223.

Measurements of the heat transfer from horizontal wires and cylinders to air in the case of a vibrating wire and of wires and cylinders of various diameters in smooth and turbulent air flow of known intensity and scale of turbulence. The Reynolds numbers ranged from 60 to 25,800.

6908* (English.) **On Measurement of Velocity by Pitot Tube.** Bengt J. Andersson. *Arkiv för Matematik*, v. 3, no. 5, 1958, p. 391-394.

6909 Convection Heat Transfer and Pressure Drop of Air Flowing Across In-Line Tube Banks. I. Apparatus, Procedures, and Special Effects. C. E. Jones and E. S. Monroe, Jr. **II. Correlation of Data for Ten-Row-Deep Tube Banks.** A. J. Gram, C. O. Mackey, and E. S. Monroe, Jr. *ASME, Transactions*, v. 80, Jan. 1958, p. 18-35.

6910 Heat Transfer and Fluid Friction During Flow Across Banks of Tubes. VI. The Effect of Internal Leakages Within Segmentally Baffled Exchangers. O. P. Bergelin, K. J. Bell, and M. D. Leighton. *ASME, Transactions*, v. 80, Jan. 1958, p. 53-60.

6911 Heat Transfer From a Rotating Cylinder With and Without Crossflow. W. M. Kays and I. S. Bjorklund. *ASME, Transactions*, v. 80, Jan. 1958, p. 70-78.

Shows two flow regimes: one at low rotating speeds where the effects of crossflow are controlling and the boundary layer separates like that of the nonrotating cylinder; the other at high rotating speeds where there is a continuous boundary layer around the cylinder with no separation and the rotating effects control the heat-transfer rate.

6912 Analysis of Incompressible, Nonviscous Blade-to-Blade Flow in Rotating Blade Rows. J. J. Kramer. *ASME, Transactions*, v. 80, Feb. 1958, p. 263-275.

Method covering flow through a centrifugal impeller (including the inlet region) with or without splitter vanes was developed and applied to a 48-in. diameter centrifugal impeller. Solutions for the entire blade passage were obtained for four weight flows ranging from incipient surge to maximum as determined by actual impeller tests.

6913 Two-Phase Flow in Rough Tubes. D. Chisholm and A. D. K. Laird. *ASME, Transactions*, v. 80, Feb. 1958, p. 276-286.

Data for pressure drop and saturation during flow of air-water mixtures in smooth and rough horizontal tubes.

6914 Laminar Flow Over an Enclosed Rotating Disk. S. L. Soo. *ASME, Transactions*, v. 80, Feb. 1958, p. 287-296.

Analysis is restricted to the case of incompressible laminar flow; an approximate solution for turbulent flow is given.

6915 Transient Free Convection From a Vertical Flat Plate. Robert Siegel. *ASME, Transactions*, v. 80, Feb. 1958, p. 347-359.

The method of characteristics is employed to obtain solutions to the time dependent free-convection equations of momentum and energy placed in integral form. Two boundary conditions are considered for a vertical flat plate of infinite width and semi-infinite length which is initially at ambient temperature in quiescent fluid.

6916 Laminar Mass and Heat Transfer From Ellipsoidal Surfaces of Fineness Ratio 4 in Axisymmetrical Flow. Shao-Yen Ko and H. H. Sogin. *ASME, Transactions*, v. 80, Feb. 1958, p. 387-390.

6917 Report on Boiling Heat Transfer. Novak Zuber. *Columbia University, Heat Transfer Research Laboratory (U. S. Atomic Energy Commission)*, AECU-3569, Sept. 1957, 5 p. UF767 U3au Contin.)

A brief bibliography of Russian literature on bubble dynamics and nucleation, boiling heat transfer, burnout heat flux, and two phase flow.

6918* (Russian.) Flow of Conducting Fluids Past Magnetized Bodies. **Ob obtekanii namagnichennykh tel provodiashchei zhidkostiu.** A. G. Kulikovskii. *Doklady Akademii Nauk SSSR*, v. 117, no. 2, Nov. 11, 1957, p. 199-202.

Theoretical study of: the fluid flow of an incompressible liquid past magnetic dipole, supersonic flow past a wedge, and supersonic flow past a cone.

6919 Non-Newtonian Flow. W. L. Wilkinson. *Industrial Chemist*, v. 34, Feb. 1958, p. 79-84.

Application of non-Newtonian principles to the engineering problems of pipe-flow, heat transfer, and mixing.

6920 (English.) **An Analysis of the Error Involved in Unrolling the Flow Field in Turbine Problems.** Vernon J. Rossow. *Institut für Aerodynamik, Mitteilungen Nr.* 23, 1957, 52 p. (TL570 In8m Vis.)

6921* High-Capacity P/D Meters — Three Barrels per Second. M. J. Dabney. *ISA Journal*, v. 5, Feb. 1958, p. 54-57.

Recent improvements in high-volume positive-displacement flowmeters have upped capacities to 10,000 bbl. per hr. with an accuracy of 0.1%.

6922 On the Numerical Calculation of Detached Bow Shock Waves in Hypersonic Flow. P. R. Garabedian and H. M. Lieberstein. *Journal of the Aeronautical Sciences*, v. 25, Feb. 1958, p. 109-118.

Analysis is based on a Cauchy problem for the stream function in the subsonic region, where the motion is governed by a partial differential equation of elliptic type.

6923* Flow Measurement in the Chemical Industry. *Manufacturing Chemist*, v. 29, Jan. 1958, p. 9-14.

Deals with instruments for measuring flow in a general, nonmathematical manner, for those who want a basic knowledge of the field.

6924* Wall Effects in Shock Tube Flow. Raymond J. Emrich and Donald B. Wheeler, Jr. *Physics of Fluids*, v. 1, no. 1, Jan.-Feb. 1958, p. 14-23.

Shock strength, average density across the tube, and pressure at the walls were measured.

6925* Effect of Radiation on Shock Wave Behavior. R. E. Marshak. *Physics of Fluids*, v. 1, no. 1, Jan.-Feb. 1958, p. 24-29.

Fundamental conservation equations governing fluid dynamics and radiation are given. Rankine-Hugoniot conditions are derived for shock waves in radiation flux. Similarity solutions are obtained for the constant density and constant pressure cases.

6926* Hydromagnetic Stability of a Conducting Fluid in a Circular Magnetic Field. Frank N. Edmonds, Jr. *Physics of Fluids*, v. 1, no. 1, Jan.-Feb. 1958, p. 30-41.

6927 Shock Waves in a Liquid Containing Gas Bubbles. I. J. Campbell and A. S. Pitcher. *Royal Society, Proceedings*, v. 243, ser. A, Feb. 11, 1958, p. 534-545 + 1 plate.

Considerations of continuity, momentum, and energy together with an equation of state are applied to the propagation of plane shock waves in a gas + liquid mixture. It is shown from entropy considerations that a rarefaction wave cannot propagate itself without change of form, and it is argued that a compression wave can be expected to steepen into a shock wave. Considerations of the collision between two normal shock waves moving in opposite directions, suggests that the strengths of the two shocks are unaltered by the interaction between them.

6928 Impact on a Compressible Fluid. I. T. Egorov. *U. S. National Advisory Committee for Aeronautics, Technical Memorandum* 1413, Feb. 1958, 12 p. (Translated from *Prikladnaia Matematika i Mekhanika*, v. 20, no. 1, 1956.) (TL570 Un3tm)

Theoretical solution of vertical hydrodynamic impact of a flat rigid body on the surface of a nonviscous compressible fluid. Histories of kinetic energy and momentum for impacts at 5 m/sec on water, alcohol, and pentane are calculated.

See also: **6195** (hypersonic flow); **6399** (fluidization).

FOOD TECHNOLOGY

6929 The Refining and Bleaching of Vegetable Oils. Edward M. James. *American Oil Chemists' Society, Journal*, v. 35, Feb. 1958, p. 76-83.

6930 Pilot-Plant Preparation of Edible Safflower Oil. R. E. Beal, H. A. Moser, and O. L. Brekke. *American Oil Chemists' Society, Journal*, v. 35, Feb. 1958, p. 97-99.

Pilot-plant tests with two lots of commercial, alkali-refined safflower oil show that no difficulty is experienced in producing a salad oil of good, initial quality with good flavor stability when stored at 60 C in the dark.

6931 Colorimetric Estimation of Malathion Residues in Animal Products. M. V. Norris, E. W. Easter, L. T. Fuller, and E. J. Kuchar. *Journal of Agricultural and Food Chemistry*, v. 6, Feb. 1958, p. 111-114.

A colorimetric method for the estimation of spray residues of malathion on plant material has been adapted to the analysis of animal products. This has led to a more detailed study of the basic procedure, and a number of improvements and modifications have been made.

6932* Growth and Thermal Destruction of *Micrococcus pyogenes* Var. *aureus* in Heated and Raw Milk. B. Heinemann. *Journal of Dairy Science*, v. 40, Dec. 1957, p. 1585-1589.

Raw milk did not provide a favorable environment for the growth of *Micrococcus pyogenes* var. *aureus*, but it grew well at 80 to 115 F in pasteurized skimmilk and in condensed skimmilk, containing 42% total solids.

6933* Use of Antimicrobial Paints and Sealers in the Dairy Industry. J. H. Richardson. *Journal of Dairy Science*, v. 40, Dec. 1957, p. 1628-1629.

An effective antimicrobial agent for structural materials in Cunilate, a soluble form of Cu-8-quinolinolate.

6934 Analytical Data on Some Common Fruits. R. W. Money. *Journal of the Science of Food and Agriculture*, v. 9, Jan. 1958, p. 18-20.

Presentation of tabular data on bananas, grapefruit, lemons, sweet oranges, melons, and pineapples.

See also: **6228** (mineral nutrition).

FUELS AND COMBUSTION

6935* (German.) Some Problems of Chain Reactions and the Combustion Theory. **Einige Probleme der Kettenreaktionen und der Verbrennungstheorie.** N. N. Semenov. *Angewandte Chemie*, v. 69, no. 24, Dec. 21, 1957, p. 767-777.

A review on propagation of flames, detonation velocity in gas mixtures, and development of the theories of chain reactions with reference to their significance for chemical technology.

6936 Calculation of Theoretical Flame Temperatures in Furnaces. J. W. Myers, S. A. Goldberg, and R. W. Smith, Jr. *ASME, Transactions*, v. 80, Jan. 1958, p. 202-216.

Enthalpy data were calculated for gaseous combustion products for various gas-composition and temperature values within the range expected when burning coal, coke, and liquid and gaseous hydrocarbon fuels with air at atmospheric pressure and at fuel-to-air ratios ranging from stoichiometric conditions to 100% excess air.

6937* (German.) Adjustment of the Most Favorable Air Quantity for Furnaces. **Einstellung der günstigsten Luftzufuhr bei Feuerungen.** Wilhelm E. Germer. *Brennstoff-Wärme-Kraft*, v. 10, no. 1, Jan. 1958, p. 10-11.

A simple method has been developed, based on the determination of the fuel-air ratio derived from a measurement of the steam and flue gas discharges.

6938 On the Width of Coke-Oven Chambers. B. I. Kustov. *Henry Brutcher Translation No.* 3844, 15 p. (From *Stal'*, v. 15, no. 5, 1955, p. 391-396.) Henry Brutcher, Altadena, Calif.

Nature of correlation between coking time and chamber width as function of temperature conditions. Role of characteristics of coal blends in selection of chamber width. Coke quality as affected by chamber width.

6939 The Combustion of Coal. A. C. Monkhouse. *Chemistry & Industry*, 1958, no. 3, Jan. 18, p. 52-64.

Recent developments aimed at using coal with maximum efficiency and reducing air pollution.

6940 Rates of Reaction in the Carbonization Process. G. R. Oxley and G. J. Pitt. *Fuel*, v. 37, Jan. 1958, p. 19-24.

Apparatus in which coal can be carbonized isothermally was used to study the formation of chloroform-soluble material during carbonization. The rate of formation of this material is much higher than the rate of development of fluidity in the coal.

6941 Kinetics of the Sorption and Desorption of Methanol on Coal. P. Fugassi, G. Ostapchenko, and R. Trammell. *Fuel*, v. 37, Jan. 1958, p. 36-46.

6942 Standardization of the Methods of Analysis of Coal and Coke. XXII. Occurrence of Oxides of Nitrogen and Sulphur in the Determination of Carbon and Hydrogen in Coal. R. A. Mott and H. C. Wilkinson. *Fuel*, v. 37, Jan. 1958, p. 62-70.

6943 Oxygen Analysis and Combustion Control. J. C. Farquhar. *Fuel Efficiency*, v. 6, Jan. 1958, p. 30-32.

Continuous analyzer for O in flue gas depends only on the physical measurement of the paramagnetism of O.

6944* (Russian.) Aerodynamic Design of Gas Generators. **Aerodinamicheskie raschety gasogeneratorov.** S. A. Malkin. *Gazovaia Promyshelnnost'*, 1957, no. 12, Dec., p. 8-15.

New method by dividing the fuel layer into zones that differ in structure and temperature conditions.

6945* (Russian.) The Production of Acetylene From Natural Gases. **Proizvodstvo atsetilena iz prirodnykh gazov.** B. S. Grinenko and V. B. Berkovich. *Gazovaia Promyshlennost'*, 1957, no. 12, Dec., p. 26-31.

Shows the composition of gases obtained during the pyrolysis of hydrocarbons by various methods, as well as technical-economic indexes of acetylene production.

6946* (Russian.) The Hydraulic Resistance of Activated Carbon During the Passage of Gas. **Gidravlicheskoe soprotivlenie aktivirovannogo uglia pri prokhozhdenii gaza.** N. V. Kel'tsev. *Gazovaia Promyshlennost'*, 1957, no. 12, Dec., p. 31-35.

The hydraulic resistance of industrial activated carbons to the flow of various gases, such as N, CO_2, CH_4, and H was tested.

6947* (Russian.) The Effect of the Conversion Reaction of CO on the Gasification Process of Coal With Water Vapor. **Vliianie reaktsii konversii okisi ugleroda na protsess gazifikatsii uglia vodianym parom.** N. V. Lavrov and G. V. Grebenshchikova. *Gazovaia Promyshlennost'*, 1958, no. 1, Jan., p. 20-25.

The effect of the nature of the carbon material, reaction components, and temperature on the reaction rate.

6948* Grindability of Indian Coals. A. Ghosal, L. C. Roy, R. N. Bose, and A. Lahiri. *Institute of Fuel, Journal*, v. 31, Feb. 1958, p. 50-55.

An attempt at correlating certain properties of coal such as moisture and volatile matter with the Hardgrove grindability index showed that the grindability of coal is closely related to its rank. The effect of ash and petrographic constituents of coal on the grindability indices of various size and specific gravity fractions of a coal was also noted.

6949* Structure and Permeability of Fuel Beds: The Influence of Some Physical Factors. N. Y. Kirov and G. à Donau Szpindler. *Institute of Fuel, Journal*, v. 31, Feb. 1958, p. 63-71.

Main factors studied were voidage, surface moisture, particle size, and influence of fines. Results provide a satisfactory explanation of the influence of moisture conditioning on the structure of a coal bed and its effect during the burning of coal on travelling-grate stokers. A general relationship for calculation of optimum surface moisture content for a coal of given size is suggested.

6950* A Study of Sampling of Flame Gases. C. Halpern and F. W. Ruegg. *Journal of Research, National Bureau of Standards*, v. 60, Jan. 1958, p. 29-37.

A study of sampling of hot combustion gases by means of water-cooled probes with internal diameters of 0.027 to 0.070 cm. Effect of conditions of sampling on concentrations of CO, CO_2, H_2, and H_2O.

6951* (Russian.) Effect of Crushing of Coking Coal and Charge. **Vliianie stepeni izmel'cheniia uglei i shikhty pri koksovanii.** S. G. Aronov and L. P. Svetlorusova. *Koks i Khimiia*, 1958, no. 1, p. 5-11.

Relation between the total grain surface of charge and the strength of the formed coke. Interaction of the grains in mixtures; depth of mutual penetration of the thermal destruction products. Studies by means of $Ca^{48}O$ isotope.

6952* (Czech.) Coking of Solid Coal Tar. **Koksování tvrdé smoly.** R. Riedl, Z. Medřický, and V. Potomský. *Paliva*, v. 37, no. 12, Dec. 1957, p. 406-411.

The coking process of the solid tar in a steel cylinder. Determination of the temperature and viscosity of a coking tar and composition of gases, and oil content at various stages of the process.

6953* Elementary Reactions in Gas-Phase Slow Combustion. C. F. H. Tipper. *Quarterly Reviews*, v. 11, no. 4, 1957, p. 313-338.

A review of suggested mechanisms.

6954 (French.) Kinetic Study of the Combustion of Cyanogen. **Étude cinétique de la combustion du cyanogène.** H. James. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 12, no. 12, Dec. 1957, p. 1241-1293.

The combustion of cyanogen was studied by the static method at pressures below atmospheric, using air or O diluted or not by the addition of a chemically inert gas, Ar or He, to bring about combustion.

6955 Study of Ultra High Temperatures. The Combustion of Carbon Subnitride, C_4N_2, and a Chemical Method for the Production of Continuous Temperatures in the Range of 5000-6000° Kelvin or 9000-11,000° Rankine. A. V. Grosse and A. D. Kirshenbaum. *U. S. Department of Commerce, Office of Technical Services*, PB 121074, Dec. 1955, 37 p. (T21 Un3r Contin.)

6956 Measurement of Detonation Induction Distances in Hydrogen-Oxygen and Acetylene-Oxygen-Nitrogen Mixtures at Normal and Elevated Initial Pressures and Temperatures. Loren E. Bollinger and Rudolph Edse. *Wright Air Development Center, WADC Technical Report* 57-414, June 1957, 99 p. (TL507 Un3.18w Vis.)

Detonation induction distances were measured in a 15-mm. diameter tube for fuel concentrations ranging from 30 to 85 mol. % under initial pressure and temperature conditions of 1, 5, 10, and 25 atm. and 100 F and 1 and 10 atm. at 200 C.

6957* (Russian.) Measurement of Ionization Intensity in Flames. **Izmerenie intensivnosti ionizatsii v plamenakh.** V. S. Rossikhin and N. A. Nesterko. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2663-2667.

Measuring the ionization intensity in the reaction zone of flame by means of the saturation current. Application of obtained values for determination of the ionization intensities in the reaction zone of acetylene-air and acetylene-oxygen flames.

See also: **6398** (ignition of H_2O_2); **6589** (hydrocarbon combustion); **6687** (high temp. kinetics of the H-Br reaction); **7136** (heat economy values for iron metallurgy).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

6958 (English.) **The Swedish Radioscientific Solar Eclipse Expedition to Italy, 1952. Preliminary Report.** S. I. Svensson, G. Hellgren, and O. Perers. *Acta Polytechnica (Electrical Engineering Series)*, v. 7, no. 6, 1957, 30 p. (T1 Ac81 Vis.)

6959* Argillation and Direct Bauxitization in Terms of Concentrations of Hydrogen and Metal Cations at Surface of Hydrolyzing Aluminum Silicates. W. D. Keller. *American Association of Petroleum Geologists, Bulletin*, v. 42, Feb. 1958, p. 233-245.

6960* Thorium-to-Uranium Ratios as Indicators of Sedimentary Processes: Example of Concept of Geochemical Facies. John A. S. Adams and Charles E. Weaver. *American Association of Petroleum Geologists, Bulletin*, v. 42, Feb. 1958, p. 387-430.

Over 200 new Th and U determinations were made by γ-ray spectral and α activity-fluorometric U techniques. Together these can be used as test of secular radioactive equilibrium.

6961 Present Position and Future Possibilities of Weather Control. Henry G. Houghton. *American Meteorological Society, Bulletin*, v. 38, Dec. 1957, p. 567-570.

6962 Cloud Distributions in the Vicinity of Jet Streams. George S. McLean. *American Meteorological Society, Bulletin*, v. 38, Dec. 1957, p. 579-583.

A knowledge of cloud distributions may be used as an in-flight aid for identifying and locating jet streams.

6963 A New Method for Orienting Electron Microscope Replicas Applied to Twinned Quartz. Robert V. Rice and Alvin J. Cohen. *American Mineralogist*, v. 43, Jan.-Feb. 1958, p. 25-33.

6964 The System Fe_2O_4-Mn_3O_4. H. J. Van Hook and M. L. Keith. *American Mineralogist*, v. 43, Jan.-Feb 1958, p. 69-83.

The extent of immiscibility was determined by preparing and quenching oxide compositions at temperatures within the two-phase region.

6965* (English.) **On Determining the Orientation of a Cylindrical Artificial Earth-Satellite.** R. J. Davis, R. C. Wells, and F. L. Whipple. *Astronautica Acta*, v. 3, no. 4, 1957, p. 231-236.

A method is proposed for determining this orientation by observing the flash from a specularly reflecting cylindrical surface. Only half the surface would be made specularly reflecting; the other half would be a diffuse reflector to allow continuous observation of the object as well.

6966* The Distribution of Radio Brightness Over the Solar Disk at a Wavelength of 21 Centimetres. IV. The Slowly Varying Component. W. N. Christiansen, J. A. Warburton, and R. D. Davies. *Australian Journal of Physics*, v. 10, Dec. 1957, p. 491-514.

6967* Oscillations of a System of Disk Dynamos. Tsuneji Rikitake. *Cambridge Philosophical Society, Proceedings*, v. 54, Jan. 1958, p. 89-105.

Behavior of two coupled disk dynamos is related to the earth's magnetic field, to show that reversals of electric current and magnetic field occur. The coupling between electro-magnetism, motion, and heat is discussed.

6968 Horizontal Movements of Aurora. J. S. Kim and B. W. Currie. *Canadian Journal of Physics*, v. 36, Feb. 1958, p. 160-170.

Measurements on the drifts of auroral forms at three stations to the south of the auroral zone in West-Central Canada failed to show evidence of a motion due to the earth's rotation relative to fixed excitation patterns in space. The distribution and the magnitude of the speed of auroral structures parallel and normal to the geomagnetic meridians are substantially the same as for non-luminous ionic irregularities observed by radio methods.

6969 1957 Developments in Mining and Preparation. *Coal Age*, v. 63, Feb. 1957, p. 96-102.

In deep mining: increasing use of continuous mining, better servicing, more attention to operating standards and controls. In stripping: larger shovels, improved drilling and blasting of over-burden, increased augering. In preparation: new drying and tabling equipment, increased economy in plant design, and stainless-steel sheathing.

6970* Bibliography of Graduate Theses on Geophysics in U. S. and Canadian Institutions. George E. Tarbox. *Colorado School of Mines, Quarterly*, v. 53, Jan. 1958, 55 p.

6971* (French.) Study of the Distribution of Radioactivity and Lead in a Zircon Crystal. **Étude de la répartition de la radioactivité et du plomb dans un cristal de zircon.** Marcel Roubault and René Coppens. *Comptes Rendus*, v. 246, no. 1, Jan. 6, 1958, p. 137-140.

Systematic analyses of U and Pb in different parts of a large zircon crystal showed a heterogeneous distribution of the two determinations varied by from 50 to 100%.

6972 Earth Flexures, Their Geometry and Their Representation and Analysis in Geological Section With Special Reference to the Problem of Oil Finding. H. G. Busk. 106 p. 1957. William Trussell, New York. (QE33 B96e)

6973* Uranium Deposits in Western North Dakota and Eastern Montana. Donald Towse. *Economic Geology*, v. 52, Dec. 1957, p. 904-913.

6974* Studies of the System Iron Oxide-Silica-Water at Low Oxygen Partial Pressures. S. S. Flaschen and E. F. Osborn. *Economic Geology*, v. 52, Dec. 1957, p. 923-943.

In hydrothermal studies the ferrous silicates, fayalite, greenalite, and minnesotaite were synthesized and their stability relations investigated. Equilibrium in the system FeO-Fe_3O_4-SiO_2-H_2O is discussed.

6975 Low Noise Converter for IGY Propagation Study. Leonard F. Garrett. *Electronics*, v. 31, Jan. 31, 1958, p. 52-54.

Converter with voltage gain of 36 db, bandwidth of 4 mc and noise figure of 2.5 db is applicable to meteor, aurora, and forward scatter propagation studies.

6976* (German.) Recent Investigations Into the Problem of Heavy-Oil Production From Sand Fields. **Neuere Untersuchungen zur Frage der Schwerölgewinnung aus Sandlagerstätten. I.** Mining Production and Flood Method. **Bergmännische Gewinnung und Flutverfahren.** Christoph Schmid. *Erdöl und Kohle*, v. 11, no. 1, Jan. 1958, p. 6-11.

6977* (Russian.) The Behavior of Uranium and Thorium in Sulfate-Carbonate and Phosphate Media of the Hypergenesis Zone. **Povedenie urana i toriia v usloviiakh sul'fatno-karbonatnoi i fosfatnoi sred zony gipergeneza.** V. V. Shcherbina. *Geokhimiia*, 1957, no. 6, p. 493-506 + 1 plate.

Disemination of halos in loose deposits, and evaluation of the endogenetic ore formation as a means in searching for radioactive ores.

6978* Potassium-Argon Dating of Sedimentary Rocks. Joseph Lipson. *Geological Society of America, Bulletin*, v. 69, Feb. 1958, p. 137-149.

6979 Introduction to the Mechanics of Stellar Systems. Rudolf Kurth. 174 p. 1957. Pergamon Press, New York. (QB351 K96i)

Analysis of stellar systems as assemblies of gravitating mass-points or as gravitating continua; statistical studies.

6980* The Waveforms of Atmospherics and the Propagation of Very Low Frequency Radio Waves. J. Chapman. *Journal of Atmospheric and Terrestrial Physics*, v. 11, nos. 3-4, 1957, p. 223-236 + 2 plates.

Only waveforms generated by the return-stroke of a lightning discharge to earth are considered.

6981* Radio Reflections From Aurorae. III. The Association With Geomagnetic Phenomena. K. Bullough, T. W. Davidson, T. R. Kaiser, and C. D. Watkins. *Journal of Atmospheric and Terrestrial Physics*, v. 11, nos. 3-4, 1957, p. 237-254.

A good correlation is found between the daily frequency distribution of the radio echoes and the mean daily variation in magnetic disturbance.

6982* Free-Air Turbulence. Albert D. Anderson. *Journal of Meteorology*, v. 14, Dec. 1957, p. 477-494.

Reports 1877 layers of turbulence, measured from 3000 to 18,300 m. at four widely separated locations during all seasons by a parachuted telemetering instrument, which were analyzed by reducing the data to punched cards with the corresponding meteorological data.

6983* Some Theoretical Aspects of the Relation of Surface Electric Field Observations to Cloud Charge Distributions. Donald R. Fitzgerald. *Journal of Meteorology*, v. 14, Dec. 1957, p. 505-512.

Analytic criteria for the selection of simultaneous values of surface electric field data for solution of equations of the conventional point-charge type. A new representation of the cloud charge distribution in terms of the monopole and dipole moments.

6984 Evaluation of a Conducting-Paper Analog Field Plotter as an Aid in Solving Ground-Water Problems. Leslie E. Mack. *Kansas. State Geological Survey Bulletin No.* 127, pt. 2, 1957, p. 27-47. (TN21 K13b Vis.)

Electrical theory and model experiments show that the plotter cannot be applied accurately to any three-dimensional, steady-state, ground-water flow problems. Two-dimensional studies can be accomplished readily with the plotter, but other devices will have to be utilized for radial flow problems.

6985* Mechanization in Coal Mines. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 54-60.

Expansion in mechanized methods of mining and bringing the product to the surface. Machines which are being increasingly used include hydraulic coal bursters, coal cutters and loaders, shuttle cars, conveyor belts, locomotives, and the system of Koepe winding for shaft transport. Progress underground is also facilitated by the use of light alloy cars and roof supports.

6986* Rhodesite, a New Mineral From the Bultfontein Mine, Kimberley. E. D. Mountain. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 607-610.

The same rhodesite is proposed for a fibrous mineral, with α 1.502, β 1.506, γ 1.515, elongation γ, extinction, straight, sp. gr. 2.36. The composition is near $4(Ca,Na_2K_2)O\text{-}10SiO_2\text{-}7H_2O$, and the water is all zeolitic.

6987* An Investigation of Two New Minerals: Rhodesite and Mountainite. J. A. Gard and H. F. W. Taylor. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 611-623.

Data on rhodesite was obtained by means of electronmicroscope, X-ray, and other methods. With it occurs a similar but distinct fibrous mineral, which appears to be a new species for which the name "mountainite" is proposed. Its characteristics, unit-cell content, and optical properties. Both rhodesite and mountainite show close similarities to the fibrous zeolites, mountainite in particular resembling thomsonite.

6988* Heating Experiments on Some Natural Titaniferous Magnetites. E. A. Vincent, J. B. Wright, R. Chevallier, and Suzanne Mathieu. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 624-655.

Chemically analyzed samples of magnetites carrying exsolved ulvŏ-spinel and ilmenite were heated *in vacuo* at various temperatures without change in over-all chemical composition. The changes occurring were studied microscopically, magnetically, and by X-rays.

6989* Plagioclases From the Juvinas Meteorite and From Allivalite From the Isle of Rhum. P. M. Game. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 656-671.

The optical properties and specific gravity, and the variations in these properties, of analyzed plagioclases separated from the meteorite (eucrite) from Juvinas, France, are compared with the corresponding values for a terrestrial plagioclase of almost identical composition from an allivalite from Rhum.

6990* Saponite From Allt Ribhein, Fiskavaig Bay, Skye. R. C. Mackenzie. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 672-680.

Characteristics and composition of the saponite. The chemical, thermal, and X-ray data with reference to other saponite samples. Electronmicroscope examination showed a tendency to elongation in the direction of the a-axis.

6991* The Illite in Some Old Red Sandstone Soils and Sediments. R. C. Mackenzie. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 681-689.

Data obtained by X-ray-, thermal-, optical-, chemical-, and electron-microscopic methods.

6992* Sapphirine - Bearing Rocks From MacRobertson Land, Antarctica. E. R. Segnit. *Mineralogical Magazine and Journal of the Mineralogical Society*, v. 31, Dec. 1957, p. 690-697.

Analyses of the country rock, the two sapphirine-bearing rocks, and the sapphirine. The country rock is very rich in Fe and has a high FeO:MgO ratio, while the sapphirine-bearing rocks

are very low in Fe and high in MgO, approximating to ternary mixtures of MgO, Al_2O_3, and SiO_2.

6993* (Russian.) The Use of Drilling Mud Containing Sodium Silicate. **O primenenii promyvochnykh rastvorov, soderzhashchikh silikat natriia.** I. B. Adel' and A. V. Kantakusen. *Neftianoe Khoziaistvo*, v. 30, no. 1, Jan. 1958, p. 21-26.

The following compositions of drilling mud based on two different clays are recommended: 20% clay, 1% cellulose glycol ether, 17% water glass, 3% NaCl, 0.5% caustic soda, and 58.5% water; 10% clay, 1% cellulose glycol ether, 17% water glass, 3% NaCl, and 69% water.

6994 Observational Astronomy for Amateurs. J. B. Sidgwick. 358 p. 1957. Faber and Faber Ltd., London. (QB64 Si13o)

Instrumental and theoretical background for observations of solar, lunar, planetary, and meteoric phenomena.

6995* The Two Telescope Method of Stellar Photometry. R. V. Willstrop. *Observatory*, v. 77, Dec. 1957, p. 225-228.

6996 Ground Water. *Pennsylvania. Department of Internal Affairs Information Circular No.* 10, 1958, 10 p. (Reprinted from *Monthly Bulletin, Department of Internal Affairs*). (QE157 P38.7i Contin.)

Discusses the occurrence and movement of water, water tables, artesian wells, water prospecting, and well development.

6997 (French.) The Mechanics of Fluids and the Hydrocarbon Layers. **La mécanique des fluides et les nappes d'hydrocarbures.** A. Houpeurt. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 12, no. 12, Dec. 1957, p. 1219-1223.

Special characteristics of the flow of hydrocarbons in subsoil due to biphasic saturation. Low viscosity of natural gas. Monophase flows conforming with diffusivity equation. Measurements of flow and pressure of productive layers.

6998 Reduction of Atmospheric Radiocarbon Concentration by Fossil Fuel Carbon Dioxide and the Mean Life of Carbon Dioxide in the Atmosphere. G. J. Fergusson. *Royal Society, Proceedings*, v. 243, ser. A, Feb. 11, 1958, p. 561-574.

Measurements of the C-14 concentration in sets of wood samples from the northern and southern hemispheres show that the C-14 specific activity of atmospheric CO_2 has decreased by $2.03 \pm 0.15\%$ over the period 1860 to 1954, and that the present-day difference between the decrease in the northern and southern hemispheres is less than 0.50%.

6999 Pozzolanic Slurries for Injection Wells. William F. Ball and Knox A. Slagle. *World Oil*, v. 146, Feb. 1, 1958, p. 79-82.

Survey of more than 100 wells indicates many advantages, including lower pumping pressures, high fill-up without formation breakdown, and good bonding properties between pipe and formation.

See also: **6868** (space exploration); **6894** (bibliography of worlds iron ore resources); **6895** (Canadian mineral industries—1957); **6897** (mineral commodities of California); **6898** (Pennsylvania oil and gas developments in 1956); **7555** (new techniques in mineral engineering); **7603** (measurement of space-time distances).

GRAPHIC ARTS

7000* Cleaning Letterpress Printing Surfaces by Ultrasonic Methods. *British Printer*, v. 71, Feb. 1958, p. 36-40.

Methods and equipment.

7001* Some Basic Factors in Lithographic Ink Formulation & Use. E. A. Apps. *British Printer*, v. 71, Feb. 1958, p. 62-65.

Special requirements; distribution systems; direct printing; use of coated stock; importance of the blanket.

7002* (German.) Contribution to the Theory of the Optical Sensitization of Photographic Emulsions. **Ein Beitrag zur Theorie der optischen Sensibilisierung von photographischen Emulsionen.** Otto Neunhoeffer and Albrecht Keiler. *Chemische Berichte*, v. 91, no. 1, 1958, p. 122-129.

Systematic investigations of substituted *N*-phenyl-benzimidazol-trimethinecyanines seem to prove that there is a relationship between the sensitizing capacity of dyes and the degree of their ability to act as electron acceptors in the stimulated state.

7003 Some Uses of Photography in Engineering. W. C. Foulke. *Combustion*, v. 29, Feb. 1958, p. 43-48.

Successful applications include equipment location, piping design, supplementing field instructions, aid in preparing free-hand isometric sketches, equipment assembly, conferences, general study work, scale models, bringing fields and records up to date, initiating ideas, and simplifying piping drawings.

7004 Print Timer Controls Density and Contrast. James D. Weir. *Electronics*, v. 31, Feb. 14, 1958, p. 108-109.

Electronic timer, used to develop photographic prints of consistent quality, makes use of phantastron circuit to arrive at the right combination of exposure time and color filter necessary to obtain and repeat the desired exposure values. Timer controls two variables, density and exposure time.

7005 Time-Lapse Cinematography. John H. Widmyer. *Industrial Photography*, v. 7, Feb. 1958, p. 26 + 2 pages.

Researchers investigating textile problem use photo technique so that four to five hr. process can be studied in three min.

7006* Aluminium Foil: Laminating, Coating, Printing. James T. Trousdale. *Managing Printer*, v. 43, Feb. 1958, p. 9 + 3 pages.

7007* Handling Paper in the Pressroom. Robert F. Reed. *Modern Lithography*, v. 26, Feb. 1958, p. 36 + 5 pages.

Procedures for temperature conditioning, testing for moisture balance, moisture conditioning, and protecting piles of paper between printings.

7008* Camera Lens Care. H. J. Vogt. *Modern Lithography*, v. 26, Feb. 1958, p. 42 + 2 pages.

7009* Ultrasonic Agitation of Photographic or Radiographic Developer. A. L. Dighton and W. D. Stump. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 40-41.

Film processed using ultrasonic agitation is practically free of streaks ordinarily encountered with automatic film processing.

7010* The Present Status of Photographic Development in Theory and Practice. John Eggert. *Photographic Science and Engineering*, v. 1, no. 3, Jan. 1958, p. 94-103.

Theoretical study on physical and chemical development, equilibrium and reaction rate, constitution of a chemical developer, and redox potential. Use of one-substance-, composite-, and special developers.

7011* The Influence of the Development Mechanism on the Color and Morphology of Developed Silver. T. H. James and W. Vanselow. *Photographic Science and Engineering*, v. 1, no. 3, Jan. 1958, p. 104-118.

Use of *p*-methylamino-phenol and *p*-phenylenediamine as developing agents. Development by Elon followed by *p*-phenylenediamine; development by hydroquinone, hydroxylamine, and catechol. Absorption of Ag in the ultra-violet region and determination of crystal size; development of a negative-type emulsion.

7012* Some Properties of Devolper Fog. R. W. Swenson. *Photographic Science and Engineering*, v. 1, no. 3, Jan. 1958, p. 119-123.

Developer fog is characterized by the high temperature coefficient of the reaction rate and the low covering power of the developed fog silver. It is unaffected by many environmental factors, but can be accelerated by certain optical sensitizing dyes. In a metol-hydroquinone developer, the formation of fog increases with increasing pH.

7013* Internal Camera Vibrations and Their Effect on Resolution. John W. Herold. *Photographic Science and Engineering*, v. 1, no. 3, Jan. 1958, p. 124-131.

7014* An Instantaneous Electronic Color-Film Analyzer. Bernard D. Loughlin, et al. *Society of Motion Picture and Television Engineers, Journal*, v. 67, Jan. 1958, p. 17-26.

The analyzer for negative, or positive, color original film displays instantaneously a positive color picture on a color TV tube when a color original is inserted in the device. Color balance and density are adjusted by calibrated controls.

7015* A New Color Timer for Motion-Picture Films. J. W. Stafford and H. L. Baumbach. *Society of Motion Picture and Television Engineers, Journal,* v. 67, Feb. 1958, p. 81-83.

Details of a device for determining correct printing exposures for color films.

7016* A Newly Designed Optical Printer. Vern W. Palen. *Society of Motion Picture and Television Engineers, Journal,* v. 67, Feb. 1958, p. 98-102.

See also: **6785** (photographic technique for printed circuits); **6806** (photoresist printed circuits); **7048** (rotogravure cylinder gage).

HEAT POWER

7017 Shell-Side Characteristics of Shell-and-Tube Heat Exchangers. A Simplified Rating System for Commercial Heat Exchangers. Townsend Tinker. *ASME, Transactions,* v. 80, Jan. 1958, p. 36-52.

7018 Large Gas Turbines for Central Station Application. Z. S. Stys. *Electrical Engineering,* v. 77, Mar. 1958, p. 238-243.

The background for application of the gas turbine to the utility field. Experience gained with such units, difficulties encountered, and remedies taken.

7019* (French.) Automatic Regulation of Industrial Boilers. **Régulation automatique des chaudières industrielles.** G. B. de Livois. *Flamme et Thermique,* v. 10, no. 111, Dec. 1957, p. 11 + 10 pages.

Advantages and disadvantages of the closed-chain and open-chain method. Controlling each regulating component directly or indirectly by the stream output in an open-chain method. Regulation of combustion, feed-water, pumps, and superheat.

7020* Selection and Application of Cooling Towers in Steam-Electric Stations. E. E. Goitein. *Heat Engineering,* v. 32, Nov.-Dec. 1957, p. 92-99.

7021 Surface Ignition Control by Phosphorus Fuel Additives. James B. Hinkamp and Joel A. Warren. *Industrial and Engineering Chemistry,* v. 50, Feb. 1958, p. 251-256.

Data on the effectiveness of P fuel additives in controlling surface ignition in Otto-cycle engines, the manner in which P additives affect surface ignition, and the effect of various engine parameters on the value of P additives.

7022 Combustion Rates in Spherical Reactors. Malcolm A. Weiss, Robert J. Lang, and John P. Longwell. *Industrial and Engineering Chemistry,* v. 50, Feb. 1958, p. 257-264.

The combustion of iso-octane in air is 42 to 45 kcal. With other fuels, differences in reactivity tend to agree qualitatively with differences in flame temperature.

7023* (Russian.) Comparing the Cycles of Gas Turbines Having Constant Pressure and Constant Combustion Volume. **O sravnenii tsiklov gazoturbinnykh ustanovok s postoiannym davleniem i postoiannym ob'emom sgoraniia.** V. I. Lokai. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1957, no. 11, Nov., p. 92-98.

It was found that the simple cycle gas turbines with periodic combustion are much more efficient and their specific output is much higher than those turbines with constant pressure and combustion.

7024 Analysis of Regenerative Cooling in Rocket Thrust Chambers. Leo E. Dean and Lucian A. Shurley. *Jet Propulsion,* v. 28, Feb. 1958, p. 104-110.

An electrical analogy technique is used to determine the temperature and heat flux distribution within the walls of tubular and drilled passage thrust chambers which are cooled with JP-4 and RFNA, respectively.

7025* Evaporative Cooling by Diesel. *Mechanical World and Engineering Record,* v. 138, Feb. 1958, p. 61-62.

A diesel generating plant which is capable not only of supplying mill power demands at a low running cost, but also applies waste heat to the provision of low pressure steam and hot water for space heating and process requirements.

7026 The Outlook for Industrial Heat Reactors. *Nucleonics,* v. 16, Feb. 1958, p. 62-64.

Examining the prospects for nuclear industrial heat and development of heat reactors.

7027 Replacement of Piston Engines by Gas Turbines in Air Liners. H. Sammons. *Royal Aeronautical Society, Journal,* v. 62, Feb. 1958, p. 94-104.

Work done on the Convair 340, including assessment of the economics of its operation in comparison with the original piston-engined version. Comparisons of typical four-engined air liners.

7028* (Norwegian.) Competitive Relationship Between High Speed Four-Stroke and Two-Stroke Diesel Engines. **Konkurranseforholdet mellom hurtiggående firetakt og totakt dieselmotorer.** Ivar B. Stokke. *Teknisk Ukeblad,* v. 105, no. 2, Jan. 9, 1958, p. 29-36.

A study of factors effecting the highest possible efficiency, lowest possible dry weight, lowest engine weight per hp., and highest liter efficiency, especially for traction engines of the four- or two-cycle type.

7029* (Russian.) Investigation Into Efficiency of Short Turbine Blades. **Issledovanie effektivnosti korotkikh turbinnykh lopatok.** M. K. Maksutova and V. N. Zanadvorova. *Teploenergetika,* v. 5, no. 1, Jan. 1958, p. 31-33.

Method of static testing the effect of blade length and profile chord on efficiency of blading at various radial gaps.

7030* (Russian.) Investigation of the Protective Action of Phosphates at Super-High Pressures. **Issledovanie zashchitnogo deistviia fosfatov pri sverkhvysokom davlenii.** Iu. M. Lipov. *Teploenergetika,* v. 5, no. 1, Jan. 1958, p. 60-65.

Determination of the minimum amount of phosphate excess in boiler water preventing formation of sulfate scale ($CaSO_4$). Diagram of solubility of calcium phosphate and hydroxyapatite depending on pressure (at temperatures of saturation).

7031 Single Cylinder Engine Test Installation for Simulating Flight Operations. O. W. Stewart. *University of Kentucky, College of Engineering (Engineering Experiment Station Bulletin No.* 44) v. 11, no. 4, June 1957, 35 p. (TA21 K41.82b Vis.)

Description of equipment, operational procedure, and basic test data in conjunction with the establishment of this single cylinder test facility.

7032 Investigation of the Premixed Jet Fuel—Red Fuming Nitric Acid Rocket Propellant System. Loren E. Bollinger and Rudolph Edse. *Wright Air Development Center, WADC Technical Report* 57-407, Oct. 1957, 25 p. (TL507 Un3.18w Vis.)

An experimental investigation was conducted on a nominal 25-lb. thrust scale at a design chamber pressure of 300 psi. a.

See also: **6185** (rocket propulsion); **6211** (flow in turbocompressors); **6334** (ceramics in rocket engines); **6343** (ceramic rocket liners); **6626** (steam tables); **6909** (heat transfer of air); **7164** (boiler water corrosion inhibitors).

INFORMATION—PREPARATION AND DISSEMINATION

7033 Revision of the ASM-SLA Metallurgical Literature Classification. Laurence S. Foster. *American Documentation,* v. 9, Jan. 1958, p. 13-19.

Gives major features of changes in classification of metallurgical literature necessitated by recent metallurgical progress, particularly in the field of metals applications.

7034 Identification of the Conditions for Valid Application of Machines to Bibliographic Control. H. Edmund Stiles. *American Documentation*, v. 9, Jan. 1958, p. 42-49.

General discussion of indexing systems and possible usefulness of machines in various types of installations.

7035* Automatic Translation From English Into Russian. L. Korolev, S. Rasoumovski, and G. Zelenkevitch. *Automation Progress*, v. 3, Feb. 1958, p. 53-55.

Detailed account of the principles employed in the U.S.S.R. A general purpose digital electronic computer was used, with the technique of grammatical and idiomatic indices to convey the meaning within its context.

7036 Russian to English Machine Translation With Simple Logical Processing. Robert E. Wall, Jr. and Udo K. Niehaus. *Communication and Electronics*, 1958, no. 34, Jan., p. 709-714.

Deals with improvement in word-for-word Russian-English translation, location and analysis of noun phrases, and insertion of the proper English prepositions to render these phrases reasonably grammatical.

7037 Information Systems in Documentation. J. H. Shera, A. Kent, and J. W. Perry, editors. 639 p. 1957. Interscience Publishers, New York. (Z1001 Sh52i)

Papers from a symposium covering: fundamentals in systems design; documentation problems in specialized fields; semi-automatic systems; systems using accounting or statistical machines; systems using computers or computers or computer-like devices; cooperative information processing.

7038* A Classified Bibliography on the Application of Isotopes in Pure and Applied Research. I. *International Journal of Applied Radiation and Isotopes*, v. 3, no. 1, 1958, p. 46-77.

Covers 1955-1956 and will be continued in subsequent issues. Includes headings as follows: animal husbandry, entomology, photosynthesis, metabolite physiology in animals, plant physiology, nonmetabolite physiology in animals, and general animal physiology.

7039* Systems for Information Retrieval. L. J. Anthony. *Journal of Documentation*, v. 13, Dec. 1957, p. 209-221.

Report on a symposium dealing with various manually operated, machine-operated, and computer systems.

7040 Language as Choice and Chance. G. Herdan. 356 p. 1956. P. Noordhoff, N. V. Groningen, Holland. (P3 H41L)

A statistical treatment of language data aimed at providing a systematic exposition of the quantitative structure of language.

7041 Basic Cataloging Tools: Medical and Dental Supplement. Winifred A. Johnson. *Library Resources and Technical Services*, v. 2, no. 1, Winter 1958, p. 64-66.

A selective list, to be used in conjunction with the list of Basic General Cataloging Tools (Journal of Cataloging and Classification, 11:153-155).

7042 Quick Check for Writing "Instructions". Hector E. French. *Product Engineering*, v. 29, Mar. 3, 1958, p. 85 + 1 page.

A streamlined outline on how to write complete technical information about a component or process.

7043* Review of Documentation Literature and Activities, 1957. Gertrude Schutze. *Special Libraries*, v. 49, Feb. 1958, p. 70-84.

A review of the year's work in documentation, particularly concerning information centers and their management, mechanical handling of data, documentation research, and such aspects of information retrieval as classification, machine translation, and data-handling machinery.

INSTRUMENTATION

7044 Designing Thermocouples for Response Rate. R. J. Moffat. *ASME, Transactions*, v. 80, Feb. 1958, p. 257-262.

Equation predicts characteristic time within 10% for bare wire-loop-junction thermocouples from 0.016 to 0.051-in. diameter wire, mass velocities from 3 to 50 lb/sec. ft.^{2} and temperature from 160 to 1600 F. Data are presented concerning the effect of junction-weld bead size, junction exposed length, junction orientation, and radiative heat transfer from the junction.

7045 Dynamic Study of an Experimental Pneumatic Process-Pressure Transmitter. E. F. Hochschild. *ASME, Transactions*, v. 80, Feb. 1958, p. 497-504.

Dynamic analysis and synthesis study of a highly accurate pressure-measuring instrument.

7046 Strain Gage Oscillator for Flight Testing. William H. Foster. *Electronics*, v. 31, Jan. 31, 1958, p. 40-42.

Completely transistorized oscillator for resistive-type gages produces F.M. signal output that is directly proportional to applied force such as stress or pressure.

7047 Magnetic Resonance Determines Moisture. Thomas F. Conway and Robert J. Smith. *Electronics*, v. 31, Feb. 28, 1958, p. 51-53.

The absorption of R.F. energy by the nucleus of a H atom placed in a constant magnetic field is the principle used to measure the moisture content in hygroscopic solids.

7048 The GTA Cylinder Measuring Gage. D. A. Cutler. *Gravure*, v. 4, Feb. 1958, p. 24-26.

Data on an instrument which can measure the diameter of a cylinder within a tolerance of ±.0002 in.

7049* An Ultrasonic Drill for Boring Small Holes in Hard Materials. N. K. Marshall. *Industrial Diamond Review*, v. 18, Jan. 1958, p. 17-19.

A waveform is used to drive a magnetostriction transducer at an operating frequency of 28 kc. A diamond-paste loaded brass drill, 0.015-in. in diameter, is loosely held in the transducer head and is driven into an automatic rotary motion by the special waveform.

7050* Modern Industrial X-Ray Instrumentation. George L. Clark. *ISA Journal*, v. 5, Feb. 1958, p. 40-45.

A review of equipment and techniques for a variety of industrial applications.

7051 Infrared Spectrophotometry. D. R. Johnson and R. E. Moynihan. *Journal of Chemical Education*, v. 35, Feb. 1958, p. 76-79.

Special sampling techniques; use in studies of chemical and physical structure of polymers.

7052* (German.) A Comparative Determination of the Surface Size of Metal Oxides by Volumetric Measurement of the Adsorption of n-C_4H_{10}, and by Gravimetric Measurement of the Adsorption of CH_3OH. **Vergleichende Bestimmung der Oberflächengrösse, von Metalloxyden durch volumetrische Messung der Adsorption von n-C_4H_{10} und gravimetrische Messung der Adsorption von CH_3OH.** Karla Wencke. *Journal für Praktische Chemie*, v. 5, nos. 3-4, Dec. 1957, p. 182-195.

Attempts to explain a difference in surface size which is not constant but rather varies with the adsorbent as determined by these two methods.

7053 A 20 ft. Ebert Grating Spectrograph. G. W. King. *Journal of Scientific Instruments*, v. 35, Jan. 1958, p. 11-14.

Design and construction of a high-resolution spectrograph for the visible and ultra-violet regions of the spectrum.

7054 An Apparatus for the Determination of Dynamic Elastic Moduli at Low Strains. E. V. Vernon. *Journal of Scientific Instruments*, v. 35, Jan. 1958, p. 28-29.

An electronic apparatus for the determination by a resonance method of Young's modulus and the modulus of rigidity of materials in the form of cylindrical rods. Results can be obtained at strains as low as 10^{-5}.

7055* Scales for Disc Calculators and Calculators for Practical Formulae. R. K. Allan. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 67-71.

Practical rules for the design of special scales, and explanatory worked examples. (To be concluded.)

7056 Method for Fabricating Paraboloidal Mirrors. Georg Hass and James R. Jenness, Jr. *Optical Society of America, Journal*, v. 48, Feb. 1958, p. 86-87.

Mirrors with disk of confusion diameters less than 1 mm. were obtained using a convex plastic paraboloid formed by centrifugal casting on a Hg surface as the master for fabricating plastic replica mirrors.

7057 Vacuum Ebert Grating Spectrometer. Wm. G. Fastie, H. M. Crosswhite, and P. Gloersen. *Optical Society of America, Journal*, v. 48, Feb. 1958, p. 106-111.

Scanning spectrometer employs gratings as large as 5 x 7-in., has a focal length of 72-in., uses circularly curved slits 2-in. long, and can be triple passed. Specifications and performance are outlined.

7058 Extending Transducer Transient Response by Electronic Compensation for High-Speed Physical Measurements. F. F. Liu and T. W. Berwin. *Review of Scientific Instruments*, v. 29, Jan. 1958, p. 14-22.

7059 Improved Infrared Absorption Spectra Hygrometer. Rex C. Wood. *Review of Scientific Instruments*, v. 29, Jan. 1958, p. 36-42.

Instrument utilizing a light beam as the principal sensing element, consists of a radiation source, optical filters for isolating selected wavelengths of radiation, sensing path, detector, closed-loop servo-balancing system, and a standardizing method for drift correction.

7060* Viscosity Control System for Plant Processes. George J. Rosenblit and Oscar F. Haug. *Ultrasonic News*, v. 2, Feb. 1958, p. 14 + 4 pages.

Operation of the Bendix Ultra-Viscoson ultrasonic viscometer. Several systems for continuously and automatically indicating, recording, and controlling the viscosity of process fluids.

7061 A High-Speed Dilatometer Designed for Welding Research. E. C. Nelson. *Welding Journal*, v. 37, Feb. 1958, p. 57S-61S.

Design and operation of a high-speed dilatometer capable of duplicating the rapid heating rates and high temperatures which are encountered in the heat-affected zone of a weld. A continuous cooling transformation diagram for a low-carbon high-alloy steel is reported together with alternative methods of presenting such data.

See also: **6624** (flash photolysis apparatus).

LUBRICATION AND FRICTION

7062* High Speed Effects in Pneumodynamic Journal Bearing Lubrication. J. F. Osterle and W. F. Hughes. *Applied Scientific Research*, v. 7, sec. A, nos. 2-3, 1958, p. 89-99.

The steady-state operation of gas-lubricated journal bearings is analyzed for the effect of lubricant inertia on the pressure developed in the lubricant.

7063 Properties of Friction Materials. I. Experiments on Variables Affecting Noise. II. Theory of Vibration in Brakes. P. R. Basford and S. B. Twiss. *ASME, Transactions*, v. 80, Feb. 1958, p. 402-410.

Measurements of the friction of various brake linings against polished iron were made at speeds so low that surface temperature could be neglected. A theory of vibration in brakes is developed, based on the statistical nature of friction.

7064 Self-Excited Vibrations of an Air-Lubricated Thrust Bearing. L. Licht, D. D. Fuller, and B. Sternlicht. *ASME, Transactions*, v. 80, Feb. 1958, p. 411-414.

Primary causes of the undesirable "air-hammer" phenomenon, stability criteria, and influencing factors.

7065 Heat Expansion Licked by Cylindrical Roller Bearings. D. E. Batesole. *Aviation Age*, v. 28, Feb. 1958, p. 80-85.

Cylindrical roller bearings offer an ideal solution to the troublesome problem of temperature expansion posed by most turbine-driven units.

7066 The Use of Polytetrafluoroethylene as a Lubricant. E. Kay and E. D. Tingle. *British Journal of Applied Physics*, v. 9, Jan. 1958, p. 17-25.

The low strength and poor thermal conductivity of P.T.F.E. in bulk form are overcome by the deposition of thin films of P.T.F.E. on metal substrates. Tenacious films of low frictional coefficient and high load-carrying capacity can be prepared. These properties are enhanced by a surface phosphating treatment prior to application of the P.T.F.E.

7067* Elliptical Whirl of Flooded Journal Bearings. J. H. Halton. *Cambridge Philosophical Society, Proceedings*, v. 54, Jan. 1958, p. 119-127.

Studies the problem of elliptical whirl of perfectly aligned, finite, flooded, journal bearings, with incompressible isoviscous lubricant.

7068 An Investigation of the Structural Conditions in Steel Bearing-Balls. I. Berz, K. F. Hale, and C. Wainwright. *Engineering*, v. 185, Jan. 31, 1958, p. 151-153.

Equipment for stressing bearing-balls by spinning them in a rapidly rotating field; a H.F. electrical technique used for examining conditions in their surface layers. "Polar" areas were found to exist on each ball.

7069 Contact of Metallic Bodies: Effect of Tangential Force. J. S. Courtney-Pratt and E. Eisner. *Engineering*, v. 185, Feb. 7, 1958, p. 182-183.

A study of the relative tangential movements of two bodies and the size of the area of contact between them, when they are first loaded normally against each other and then subjected to tangential forces too small to cause sliding.

7070 Radiation Damage in Lubricating Greases. B. W. Hotten and J. G. Carroll. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 217-220.

When exposed to radiation, greases usually soften and then harden. Controls for this breakdown are suggested.

7071 Radiolysis and Radiolytic Oxidation of Lubricants. R. O. Bolt and J. G. Carroll. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 221-228.

Various organic fluids were exposed in a nuclear reactor and to γ radiation alone. Susceptibility to attack varied widely, aromatic materials being the most resistant. Oxidation was greatly accelerated.

7072 Compatibility of Greases. R. Tourret and A. J. S. Baker. *Institute of Petroleum, Journal*, v. 44, Jan. 1958, p. 9-13.

A number of mixtures were tested in the ASTM Wheel Bearing Grease Tester. Mixing by means of a grease worker was preferred. The occurrence of incompatibility of the greases tested was found to be unrelated either to unsatisfactory performance of one of the components forming the mixture or to mixtures of greases containing soaps of different bases.

7073 Primary Roll Neck Bearings and Their Protection. George Sackerson. *Iron and Steel Engineer*, v. 35, Feb. 1958, p. 102-110.

Fundamentals of bearing protection require polished roll necks, clean, cool, and plentiful cooling water, dependable grease source, scale guards, and accurate performance records.

7074* Fog Lubrication of Machine Tools. D. G. Faust. *Lubrication Engineering*, v. 14, Feb. 1958, p. 54-57.

Some fundamental considerations in the application of oil-fog lubrication to complex machine tools.

7075* The Effect of Additives on Crankcase Oil Filterability. R. L. Willis and E. C. Ballard. *Lubrication Engineering*, v. 14, Feb. 1958, p. 58 + 6 pages.

A laboratory engine test for studying the effects of oils and additives on the tendency of crankcase oil filters to plug. Road test data suggest that the specific detergent present in the oil has a marked effect on the rate at which an oil filter plugs.

7076 Application of Dry-Film Lubricants in Plain Bearings. M. H. Weisman. *Machine Design*, v. 30, Feb. 6, 1958, p. 107-110.

Factors influencing application and performance of recently developed dry-powder forms of lubricating materials in plain bearings.

7077* (Hungarian.) Machine Lubricants on a Mixed and Lead Basis. **Ólom- és kevertbázisú gépzsírok.** Ilona Árkosi and Tamás Lengyel. *Magyar Kémikusok Lapja*, v. 12, no. 1, Jan. 1957, p. 29-33.

Laboratory preparation of machine grease on a Pb basis and Pb mixtures. Characteristics of products and their modification as a function of various parameters.

7078* Radioactive Tracers Used to Measure Bearing Wear. M. W. Savage and L. O. Bowman. *Pipe Line Industry*, v. 8, Feb. 1958, p. 36-40.

Tests conducted on irradiated bearings showed that relative connecting rod bearing wear at different operating conditions can be predicted by using the load-carrying-capacity concept.

7079 Nylon-Clad Sleeve Bearings. D. L. Penney and F. J. Bockhoff. *Product Engineering*, v. 29, Mar. 3, 1958, p. 52-54.

Fluidizing process coats metal sleeve bearings with Nylon-11. Bearings will take high load, are cheap and moisture-resistant, and need no lubrication.

7080 (French.) Some Problems of Friction in the ATAR Turbojet. **Sur quelques problèmes de frottement du turboréacteur atar.** K. Touré and R. Lerner. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 12, Nov. 1957, p. 1198-1214.

Particular stress is laid on friction between the shaft and pinions of the fuel pump.

7081* The Lubrication of Rollers. A. W. Crook. *Royal Society of London, Philosophical Transactions*, v. 250, ser. A, no. 981, Jan. 1958, p. 387-409.

When lubricated rollers are run together they are separated by a hydrodynamically formed oil film. The thickness of this film was measured by a capacitance method up to loads of 1000 lb. per in. of face (1.76×10^8 dyn cm^{-1}) for conditions of pure rolling and for conditions of rolling with sliding such as exist at the contacts of gear teeth.

7082 Lubrication by Lamellar Solids. R. F. Deacon and J. F. Goodman. *Royal Society, Proceedings*, v. 243, ser. A, Feb. 11, 1958, p. 464-482 + 4 plates.

A study of the friction properties of graphite, MoS_2, BN, and talc. Formation of surface layers of the lamellar solids on Pt, and friction of these layers at elevated temperatures in air were examined.

7083 (German.) Sliding-, Scouring- and Stream-Wear Testing. **Gleit-, Spül- und Strahlverschleissprüfung.** K. Wellinger and H. Uetz. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 24, no. 1, Jan. 1958, p. 1-11.

Reports on wear by crystalline substances, which is the type of utmost importance from the economical standpoint.

7084 (German.) Historical Survey of Our Knowledge of Friction and Lubrication. **Von unserem Wissen über Reibung und Schmierung in geschichtlicher Betrachtung.** *Technik*, v. 13, no. 1, Jan. 1958, p. 38-40.

7085 Effect of Temperature on Rolling-Contact Fatigue Life With Liquid and Dry Powder Lubricants. Thomas L. Carter. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4163, Jan. 1958, 40 p. (TL570 Un3t)

The fatigue life of AISI M-1 tool steel was determined at 100, 250, and 450 F with di(2-ethylhexyl)sebacate lubricant and at 450 F with dry MoS_2 and graphite powders.

7086 Effect of Lubricant Base Stock on Rolling-Contact Fatigue Life. Thomas L. Carter. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4161, Feb. 1958, 28 p. (TL570 Un3t)

A methyl silicone, mineral oil, glycol, sebacate, and an adipate were tested as lubricants using groups of ½-in. air-melt AISI M-1 tool-steel balls under rolling-contact fatigue conditions in the fatigue spin rig. Lubricants whose viscosities were increased the most by pressure produced the longest fatigue lives.

7087 Friction Studies of Various Materials in Liquid Nitrogen. D. W. Wisander, W. F. Hady, and R. L. Johnson. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4211, Feb. 1958, 35 p. (TL570 Un3t)

Graphite-filled Teflon gave lower friction coefficient (0.15) and wear than other materials, including rolling-contact-bearing metals, mechanical-seal-type carbons, phenolic laminates, and a cermet. Phenolic laminates gave relatively high friction (>0.5).

7088 Effect of Fiber Orientation in Races and Balls Under Rolling-Contact Fatigue Conditions. Thomas L. Carter. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4216, Feb. 1958, 37 p. (TL570 Un3t)

A concentration of fatigue failures was observed in regions with the highest angle of intersection of fiber flow lines with the surface. In races, poorer fatigue life was observed with increasing fiber orientation angle. The ball materials studied showed a greater than normal tendency to fail in the polar or end grain areas.

7089* (German.) The Influence of Additives on Friction and Lubrication. **Beeinflussbarkeit von Reibung und Schmierung durch Zusatzstoffe.** Georg. R. Schultze. *VDI Zeitschrift*, v. 100, no. 4, Feb. 1, 1958, p. 146.

Definition of the terms "friction" and "lubrication"; the Stribeck-diagram and "mixed friction"; reasons for introducing additions; various types of additives and their effects.

See also: **6333** (kiln car bearing lubricants); **6355** (lubrication of cement-mill equipment); **7326** (production of taper bearings).

MECHANICAL ENGINEERING

7090* (English.) **The Development of Platform Canopies for the French State Railways and Roofs for Station Concourses.** S. Pascaud. *Acier, Stahl, Steel*, v. 23, no. 1, Jan. 1958, p. 6-12.

Developments of structural framework and in roof covering. Designs for modern platform shelters and roofs for platform concourses.

7091 (English.) **Creep Buckling of Cylindrical Shells.** Erik Sundström. *Acta Polytechnica (Civil Engineering and Building Construction Series)*, v. 4, no. 5, 1957, 34 p. (T1 Ac81 Vis.)

A double membrane analogy is used to determine the critical buckling time of a cylindrical shell subjected to external pressure. The effect of axial forces is included.

7092 Solve Axial Thrust Problems With Limited End Float Couplings. E. B. Mills and J. E. Petermann. *Allis-Chalmers Electrical Review*, v. 22, no. 3, 1957, p. 23-26.

Good practice for most horizontal sleeve bearing motors requires flexible couplings with limited end float.

7093* Ultimate Strength Design of Rectangular Concrete Members Subject to Unsymmetrical Bending. Tung Au. *American Concrete Institute, Journal*, v. 29, Feb. 1958, p. 657-674; *ACI Proceedings*, v. 54, 1958, p. 657-674.

7094* Mechanics of Adhesive Joints. II. Stress Distribution in Adhesive Layer Under Tensile Loading. Yonosuke Kobatake and Yukihiko Inoue. *Applied Scientific Research*, v. 7, sec. A, nos. 2-3, 1958, p. 100-108.

The problem of the cemented plate is analyzed.

7095* The Electromagnetic Pumping of Liquid Metals. J. A. S. Hilditch. *Atomics & Nuclear Energy*, v. 9, Feb. 1958, p. 42-45.

Principles of electromagnetic pumping. Design of the d.c. conduction pump. (To be continued.)

7096* Bibliography on Machinery Foundations; Design, Construction, Vibration Elimination. 25 p. 1955. Engineering Societies Library, New York. (ZTJ249 En33b Ref.)

This annotated list of 175 selected references from 1924 to 1955 covers theory, design, and construction of machinery foundations; specific problems such as foundations for heavy machinery on unstable soils; and vibration as related to foundations of hammers, turbines, oil engines, electrical machinery, steam engines, compressors, machine tools, pumps, and presses.

7097 Photoelastic Investigation of Stresses in Composite Models With Notches and Holes. Heihachi Shimada. *British Journal of Applied Physics*, v. 9, Jan. 1958, p. 34-37.

Tests under tension on a composite bar with a circular hole, and under bending, on a composite bar with a semicircular notch. The bars were of epoxy resin stiffened with duralumin strips.

7098 High Pressure Valves for High Temperature Duty. Richard A. Handschumacher. *Combustion*, v. 29, Feb. 1958, p. 49-53.

Design requirements and typical designs; uses; valve materials; valve selection; locking devices; installation and maintenance.

7099 Tests on Struts in the Elastic and Plastic Ranges. K. B. Ayers and R. C. Coates. *Engineering*, v. 185, Jan. 17, 1958, p. 88-89.

7100 Bursting Pressures and Safety Factors for Thin-Walled Vessels. N. A. Weil. *Franklin Institute, Journal*, v. 265, Feb. 1958, p. 97-116.

Equations governing instability are formulated for tensile bars and for vessels under internal pressures. Bursting stress in vessels may be lower or higher than the ultimate tensile stress, depending upon the properties of the material. The safety factor for bursting depends solely upon the strain-hardening exponent.

7101* (English.) **On a Rectangular Elastic Solid Compressed by the Forces Applied on Its Two Opposite Boundaries.** Chuji Fujii and Hiroshi Hanzawa. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1957, p. 371-382.

A method of solving a rectangular block problem by treating it as a case of plane stress.

7102* Roll-Separating Force and Minimum Thickness of Cold-Rolled Strips. K. Tong and G. Sachs. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 1, 1957, p. 35-46.

Theory for prediction of roll-separating forces, based on the concept that the process of plastic deformation in rolling may be approximated by that of plane-strain compression between parallel plates. Determination of the coefficient of friction and the flow stress of materials.

7103* On Stresses and Deformations of Ellipsoidal Shells Subject to Internal Pressure. R. A. Clark and E. Reissner. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 1, 1957, p. 63-70.

7104 How to Construct Network Diagrams. Will J. Worley. *Machine Design*, v. 30, Feb. 20, 1958, p. 163-170.

Construction and use of nomographs or network diagrams to speed repetitive calculations in solving engineering problems.

7105 Design of Thin-Wall Plastic Parts. Bennett Nathanson. *Machine Design*, v. 30, Feb. 20, 1958, p. 171-174.

Thin-walled parts produced by vacuum forming or injection molding yield economies through material savings without sacrificing utility of the part.

7106* Pneumatic Cylinders and Valves. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 80-83.

Notes on unit types and some typical tubular capacity data.

7107 Interaction Between a Vibratory Machine and Its Foundation. R. Plunkett. *Noise Control*, v. 4, Jan. 1958, p. 18-22.

The differences often found between the theoretical isolation provided by vibration isolators and that achieved in practice are in part explained by the interaction between a non-rigid machine foundation and the machine mount system. Prediction of the isolation achievable under practical conditions is described.

7108* Extended Heat Exchange Surface for Marine and Nuclear Boilers. R. E. Zoller. *North East Coast Institution of Engineers & Shipbuilders, Transactions*, v. 74, Feb. 1958, p. 205-234.

Reports 418 tests on 16 combinations of extended heating surface suitable for a boiler or its associated economizer.

7109 For Spring Action — Which Cantilever Beam Is Best? Karl Maier. *Product Engineering*, v. 29, Feb. 17, 1958, p. 83-87.

Theoretical study in order to determine which shape of cantilever beam is best as spring and energy-storing unit. Formulas for energy, spring, boundary, and distribution properties of cantilever beams under transverse loads. Spring rates and energy and volume efficiency of various shaped beams.

7110 Controlled Acceleration Devices. John R. Eastman. *Product Engineering*, v. 29, Mar. 3, 1958, p. 75-80.

Seven answers when the problem is to team together a high-acceleration power source and a machine that must start at a slower rate. Compares characteristics of various types of clutches and coupling equipment.

7111 Considerations Affecting More Economic but Equally Safe Pressure-Vessel Construction Utilizing Either Present-Day Ductile Materials or New High-Strength Less-Ductile Materials. J. J. Murphy, C. R. Soderberg, Jr., and D. B. Rossheim. *Welding Research Council Bulletin Series, No.* 27, May 1956, p. 10-39. (TS227.A1 W45b Vis.)

7112 Computation of the Stresses From Local Loads in Spherical Pressure Vessels or Pressure Vessel Heads. P. P. Bijlaard. *Welding Research Council Bulletin Series, No.* 34, Mar. 1957, 8 p. (TS227.A1 W45b Vis.)

The case of a rigid cylindrical insert, loaded by a radial load or an external moment, is considered. Direct solutions are obtained by using the theory of shallow spherical shells and results are presented in graphs.

7113 Proof-Testing Pressure Vessels Designed for Internal Pressure. R. W. Schneider. *Welding Research Council Bulletin Series, No.* 38, July 1957, 8 p. (TS227.A1 W45b Vis.)

Analyzes the significance of proof-test data.

7114* (German.) A Closed Solution for the Torsion of Cylindrical Rods With Circumferential Grooves. Determination of the Torsional Rigidity. **Eine geschlossene Lösung bei Torsion zylindrischer Stäbe mit Umlaufkerbe, Ermittlung von Drillsteifigkeiten.** Wolfgang Vocke. *Zeitschrift für Angewandte Mathematik und Mechanik*, v. 37, nos. 11-12, Nov.-Dec. 1957, p. 409-415.

Deals with the deformation problem. Computing of the torsional rigidities is facilitated by integrating along a "boundary shell".

See also: **7029** (turbine blade design); **7427** (selection of nuclear pumps).

METALLURGY

7115* The Manufacture of Titanium. James Taylor. *Advancement of Science*, v. 13, June 1957, p. 359-363.

A summary of the techniques involved in production of $TiCl_4$, reduction with Mg and Na, and melting and fabrication of Ti.

7116* (German.) Investigation of Inclusion Formation in Deoxidation With Silicon. **Untersuchungen über die Einschlussbildung bei der Desoxydation mit Silizium.** Anton Fischer and Manfred Wahlster. *Archiv für das Eisenhüttenwesen*, v. 29, no. 1, Jan. 1958, p. 1-9.

Inclusions in melts saturated with O as related to temperature and preparation of the crucible; electrochemical isolation of unsaturated and saturated Si inclusions.

7117 A Physical Metallurgical Study of Thorium-Rich, Thorium-Uranium Alloys. Gordon G. Bentle. *Atomics International, North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-Sr-2069, Jan. 1958, 28 p. (UF767 Un3.1na Contin.)

Physical property measurements and metallography were performed. Tensile tests at 500 C indicate that when commercial-grade Th is alloyed with U the ultimate and yield strengths are increased approximately 50%. Hardness data at room temperature are presented. Photomicrographs indicate that the U is dispersed uniformly as fine particles in arc-melted alloys.

7118 High Temperatures Spur Use of Nickel-Base Alloys. T. E. Kihlgren. *Aviation Age*, v. 28, Feb. 1958, p. 30-35.

Among promising new types are: Inconel 713C for castings, Incoloy 901 for sheet, and Inco 804 for oxidation resistance.

7119 Deep Drawing Steels. 93 p. 1958. American Institute of Mining, Metallurgical, and Petroleum Engineers, New York. (TN730 Am35.5d)

Twelve papers dealing with various aspects of the process metallurgy, physical metallurgy, and fabrication of deep drawing steels.

7120* (Russian.) Structural Features of Liquid Alloys of Some Binary Systems. **O strukturnykh osobennostiakh zhidkikh splavov nekotorykh dvoinykh sistem.** D. K. Belashchenko. *Doklady Akademii Nauk SSSR*, v. 117, no. 1, Nov. 1, 1957, p. 98-101.

Attempts to measure and compare the physical properties of the binary systems: Sb-Sn, Cd-Sb, Cd-Cu, Pb-Tl, Bi-Tl, and Fe-Ni.

7121 Early Ironmasters of Ohio. Gilbert F. Dodds. 16 p. 1957. Franklin County Historical Society, Columbus. (TN703 D66e)

Covers the Ohio iron industry from 1790 through 1853.

7122* Wear Resisting Materials. Walter Jakeman. *Gas Journal*, v. 293, Feb. 12, 1958, p. 338-339.

Stainless steel and Al were studied to find alternative materials to mild steel for coal, coke, and ash handling.

7123 Nickel Alloys for Controlled Thermal Expansion. E. M. Wise. *INCO*, v. 27, Dec. 1957, p. 19-21.

Detailed design data.

7124 Corrugated Steel Foil Promises Lighter, Stronger Aircraft. Bruce Mitchell. *Iron Age*, v. 181, Feb. 6, 1958, p. 102-104.

By putting miniature corrugations in thin sheets of high-strength stainless steel, it is possible to make supersonic aircraft either 25% lighter, or without adding any weight, make them withstand aerodynamic heating to 750 F.

7125 How to Get More for Your Metalworking Dollar. XIII. Ferrous Castings. *Iron Age*, v. 181, Feb. 13, 1958, p. 127-142.

Advantages of castings; properties of cast ferrous metals; design principles; purchasing tips; heat treatment; welding and joining; machining; coatings and finishes.

7126 Survey Hot-Work Tool Steels for Aircraft and Missiles. I. R. J. Nekervis, C. H. Lund, and A. M. Hall. *Iron Age*, v. 181, Feb. 27, 1958, p. 99-102.

In many respects, hot-work tool steels show great promise for the aircraft and missile applications of the future. The properties and fabricating characteristics of several steels are reported. Medium-carbon Ni-free alloys appear to be most suitable.

7127 European Steelmaking Today. Alastair McLeod. *Iron and Steel Engineer*, v. 35, Feb. 1958, p. 133-159.

A survey of the industry in Europe.

7128* High Speed Steels—Types and Treatments. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 76-78.

In an environment of new tool materials, the high speed steels continue to evolve and to meet demands for ever-increasing performance. Their scope is readily appreciated from a simple grouping of composition and properties which serve also as indicators to spheres of application.

7129 Vacuum Melted High-Temperature Alloys. *Metal Industry*, v. 92, Jan. 24, 1958, p. 63-66.

Vacuum melting techniques. Modifications of vacuum melted alloys. Elevated temperature tensile data, stress-rupture data, and temperature ratings of vacuum melted alloys. Heat-treatment. Mechanical properties. Effect of B and Zr additions.

7130 Copper and Copper Alloys. A Survey of Technical Progress During 1957. E. Voce. *Metallurgia*, v. 57, no. 339, Jan. 1958, p. 3-15.

A review of 309 references. Covers production, foundry practice, fabrication, plating, finishing, properties, applications, joining, powder metallurgy, testing, and analysis.

7131 Special Techniques in Vacuum Metallurgy. II. Michael Rivera. *Metal Treating*, v. 9, Jan.-Feb. 1958, p. 8-11.

High frequency furnaces; arc melting; temperature control; brazing furnace; high temperature sintering furnace.

7132 Niobium. II. Properties and Applications. J. H. Rendall. *Metal Treatment and Drop Forging*, v. 25, Jan. 1958, p. 7-12.

Includes use of Nb in atomic reactors.

7133* Outlook for Magnesium in Tomorrow's Missiles. J. H. Rizley. *Modern Metals*, v. 14, Feb. 1958, p. 32-34.

Urgent need for weight reduction in future missiles and supersonic aircraft promises growing use of Mg if new, improved alloys are developed. Typical mechanical properties are given.

7134* Titanium Technology. I. R. L. Jaffee. *Modern Metals*, v. 14, Feb. 1958, p. 46 + 4 pages.

Future possibilities for Ti, data on U. S. sponge producers and ore reserves, and the latest techniques in extractive metallurgy, melting, and casting are reported.

7135* Magnesium and Its Alloys. Applications in Nuclear Engineering. T. J. Heal. *Nuclear Engineering*, v. 3, Feb. 1958, p. 52-61 + 2 plates.

Physical and mechanical properties; compatibility; fabrication; effects of reactor conditions.

7136 (German.) Reference Values for the Heat Economy in Iron Metallurgical Plants. **Anhaltszahlen für die wärmewirtschaft in eisenhüttenwerken.** 5th Ed. 472 p. 1957. Verlag Stahleisen M. B. H., Dusseldorf, Germany. (TN705 V58a5)

A systematic collection of reference values brought up to date and for the use of the engineer, concerning fuel and combustion, coking plant, gas production, ore preparation, blast furnace operation, energy production, gas and air purification, and human work and working space.

7137 Regional Technical Meetings, 1957. 669 p. 1958. American Iron & Steel Institute, New York. (TS300 Am35ta Vis.)

A compilation of 35 technical papers on all phases of the iron and steel industry.

7138* (Polish.) The Production of Small Diameter Aluminum Tubes Using Bridge-Dies. **Produkcja rurek aluminiowych o małych średnicach przy użyciu matrycy mostkowej.** Zygmunt Pogan. *Rudy i Metale Nieżelazne*, v. 2, no. 3, July-Sept. 1957, p. 84-90.

A study of the design and theory of bridge-dies applied to the extrusion of 99.5% pure Al showed advantages such as better centering of the tubes, accuracy and homogeneity in the wall thickness, and possibility of making complex hollow sections with partitions.

7139* High-Boron Steels for Nuclear Reactors. *Times Review of Industry*, v. 12, new ser., Feb. 1958, p. 40 + 1 page.

Use in control rods. Physical and mechanical properties. Fabrication. Influence of Al content.

7140 USS "T-1" Constructional Alloy Steel. 64 p. United States Steel Corp., Pittsburgh. (TA472 Un3.7u Over.)

Engineering data, metallurgical characteristics, fabrication, and applications of a low carbon, quenched and tempered steel combining weldability with exceptional strength and toughness.

7141 Nickel and High-Nickel Alloys for Pressure Vessels. R. M. Wilson, Jr. and W. F. Burchfield. *Welding Research Council Bulletin Series, No.* 24, Jan. 1956, 27 p. (TS227.A1 W45b Vis.)

Analysis, physical and mechanical properties, method of determining ASME Code design stresses, embrittlement by S and Pb, cold and hot forming, thermal treatments, cleaning, pickling, welding, brazing, joining dissimilar metals, and inspection.

7142 "Preformed" Wire Products. Howard F. Stirn. *Wire and Wire Products*, v. 33, Feb. 1958, p. 176 + 4 pages.

Properties and applications of wire that has been machine formed into a helical configuration and which is the basic component of assemblies for the gripping, repairing, armoring, and splicing of nearly all types of cable.

See also: **7428** (Li nuclear technology); **7432** (Al B atomic fuel subassemblies); **7717** (welding bibliographies).

METALS—CORROSION

7143* (German.) Overtemperatures Occurring During the Scaling of Pure Iron, and Their Theoretical Treatment. **Die bei der Verzunderung von reinem Eisen auftretenden Über-**

temperaturen und ihre theoretische Behandlung. Norbert G. Schmahl, Hans Baumann, and Hermann Schenck. *Archiv für das Eisenhüttenwesen*, v. 29, no. 1, Jan. 1958, p. 41-46.

Determination of metal and scale temperatures with a heat balance during scaling in pure O at 950 C and atm. pressure. Importance of surface-heat-transfer coefficient, specimen specific surface, and time factors.

7144* (Dutch.) Corrosion Resistance of Thermally Galvanized Steel in Water of Various Kinds. **Corrosieweerstand van thermisch verzinkt staal in verschillende soorten water.** J. F. H. van Eijnsbergen. *Bedrijf en Techniek*, v. 13, no. 297, Jan. 25, 1958, p. 56-58.

Effects of dissolved salts, temperature and speed of flow, time, and nature of the construction material.

7145 Metallurgical Surface Treatment of Tinplate Produced in Liskovec [Czechoslavakia]. J. Teindl and A. Hrbek. *Henry Brutcher Translation No.* 4042, 11 p. (From *Hutnické Listy*, v. 12, no. 4, 1957, p. 329-332.) Henry Brutcher, Altadena, Calif.

Properties of oxide layers (stannous and stannic oxides), with special reference to their effectiveness in resisting the formation of black spots. Corrosion of tinplate in various acids. Modification of the Protecta-Tin process for protecting cans.

7146 (French.) Lessons on Electrochemical Corrosion. **Lecons sur la corrosion electrochimique. I.** M. Pourbaix. *Centre Belge d'Etude de la Corrosion, Rapport Technique*, no. 57, Nov. 1957, p. 1-19 + 7 plates. (TA462 C33r Vis.)

A study of corrosion from the economical and technical viewpoint. Reaction of Fe in different aqueous solutions, in a NaOH solution, and in HNO_3 Fe used as anode or cathode. Effect of electric currents. Application of electrochemical thermodynamics to Fe, Zn, and Mn.

7147* (French.) Corrosion in High Temperature Furnaces. **La corrosion dans les chaudières à haute température.** Max Werner. *Centre Belge d'Etude et de Documentation des Eaux, Bulletin (Trimestrielle)*, 1957, no. 38, p. 215-223.

Studies corrosion resistance in austenitic steels in contact with seam or combustion gases. Vanadium addition improves breaking point but causes considerable oxidation from 650 C up; added B gives better resistance.

7148* (French.) Constitution and Morphological Study of the Film of Superficial Iron Oxidation in Steam at High Temperatures. **Sur la constitution et la morphologie de la pellicule d'oxydation superficielle du fer dans la vapeur d'eau aux températures élevées.** Jean Païdassi and David Fuller. *Comptes Rendus*, v. 246, no. 4, Jan. 27, 1958, p. 604-607.

Investigations between 700 and 1250 C showed that the adhesion of the film to the metal is very different according to the oxidizing atmosphere used. The film is made of one layer of ferrous oxide only, except between 900 and 950 C where there is a discontinuous external layer of magnetite.

7149 Corrosion of Stainless Steels in Boiling Acids and Its Suppression by Ferric Salts. Michael A. Streicher. *Corrosion*, v. 14, Feb. 1958, p. 19-30.

The acids used were oxalic, formic, acetic, hydroxyacetic, phosphoric, sulfuric, sulfamic and sodium bisulfate, and the stainless steels included straight Cr (AISI 400 series), 18 Cr-8 Ni (AISI 300 series), and some Cr-Mn-Ni steels.

7150 Effect of Inhibitors in Fuming Nitric Acid on Corrosion and Oxidation. Tin Boo Yee. *Corrosion*, v. 14, Feb. 1958, p. 42-44.

A procedure was developed by which an inhibitor for fuming HNO_3 can be selected in order to give good inhibition to corrosion and, at the same time, increase the oxidizing power of the fuming HNO_3.

7151 Staining of Copper and Brass. Einar Mattsson. *Corrosion*, v. 14, Feb. 1958, p. 48-52.

A survey of staining phenomena.

7152 Electrochemical Deterioration of Graphite and High-Silicon Iron Anodes in Sodium Chloride Electrolytes. S. Tudor, W. L. Miller, A. Ticker, and H. S. Preiser. *Corrosion*, v. 14, Feb. 1958, p. 53-59.

Laboratory methods were developed for correlating electrochemical deterioration rates of various graphite and high-silicon iron anodes with current drain in NaCl electrolytes of 50, 1000, and 5000 ohm-centimeter specific resistivities.

7153 Corrosion Products of Mild Steel in Hydrogen Sulfide Environments. F. H. Meyer, O. L. Riggs, R. L. McGlasson, and J. D. Sudbury. *Corrosion*, v. 14, Feb. 1958, p. 69-75.

The relations between corrosion rates and different forms of sulfide corrosion product are defined by the application of standard and novel X-ray diffraction studies of the corrosion products.

7154* (French.) Corrosion of Iron Alloys by Superheated Steam. **La corrosion des alliages de fer par la vapeur d'eau surchauffée.** T. Samuel. *Corrosion et Anticorrosion*, v. 6, no. 1, Jan. 1958, p. 3-8.

Surveys studies of high temperature oxidation of Fe-alloys by air and O and theories for calculating rate of oxidation. Oxidation time and effects of alloy elements.

7155* (French.) Colloidal Interpretation of Corrosion and Inhibition Phenomena. **Sur une interprétation colloïdale des phénomènes de corrosion et d'inhibition.** Jean Frasch. *Corrosion et Anticorrosion*, v. 6, no. 1, Jan. 1958, p. 9-14.

Colloids of metals and their hydroxides. Electrical charge of amphoteric colloids. Corrosion and protection of metals producing such colloids. Electrochemical theories of Fe corrosion and colloids.

7156* (French.) Corrosion Phenomena of Tubular Condensers. Typical Examples. Prevention and Remedies. **Les phénomènes de corrosion des condenseurs tubulaires. Quelques exemples caractéristiques. Remèdes préventifs et curatifs.** A. J. Maurin. *Corrosion et Anticorrosion*, v. 6, no. 1, Jan. 1958, p. 15-24.

The following means, from experimental studies are effective in reducing or eliminating condenser corrosion: cast iron or steel surfaces in contact with water, Cu-alloy pipes, usual protection of Cu-alloys and ferrous metals.

7157* Corrosion in Nuclear Power Production. B. L. Harbourne. *Corrosion Prevention and Control*, v. 5, Jan. 1958, p. 43-47.

Corrosion problems and remedies associated with CO_2 cooled-graphite moderated, Na cooled, and pressurized water cooled-and moderated reactors.

7158 High Temperature Hydrogen Sulphide Corrosion in Commercial Sovaformer Units. II. E. B. Backensto, R. D. Drew, and J. N. Vlachos. *Corrosion Technology*, v. 5, Feb. 1958, p. 53-56.

Tests with static-bed reformer utilizing a Pt-type catalyst show that both temperature and H_2S concentrations are basic variables. Aluminizing, especially with diffused coatings, prevents sulfide scaling attack.

7159* (Russian.) Electrochemical Principles of Metal Protection in Strong Oxidizers. **Elektrokhimicheskie printsipy zashchity metallov v silnykh okisliteliakh.** V. P. Batrakov. *Doklady Akademii Nauk SSSR*, v. 117, no. 2, Nov. 11, 1957, p. 252-254.

Recommends decreasing the reduction-oxidation potential of the medium, increasing the overvoltage of the anodic process, or increasing the overvoltage of the cathodic process.

7160* (English.) **Vapour Phase Corrosion Inhibitors. I. Different Types and Performance.** K. S. Rajagopalan. *Electrochemical Society, Bulletin of India Section*, v. 7, Jan. 1958, p. 14-21.

7161* (German.) On the Planning of Electric Protective Equipment for Underground Pipe Lines. **Über die Projektierung elektrischer Schutzanlagen für erdverlegte Rohrleitungen.** W. Richter. *Energietechnik*, v. 7, no. 12, Dec. 1957, p. 550-552.

Corrosion of pipes and means of protection against it.

7162* (German.) Investigations of the Alternating Current Corrosion of Iron as Function of the Current Density and Frequency. A Contribution to the Study of Alternating Current Corrosion of Underground Conduits. **Untersuchungen über die Wechselstromkorrosion von Eisen in Abhängigkeit von der Stromdichte und Frequenz. Ein Beitrag zur Wechsel-**

stromkorrosion erdverlegter Rohrleitungen. Walter Fuchs, Heinrich Steinrath, and Helmut Ternes. *Gas- und Wasserfach*, v. 99, Ausgabe Wasser, no. 2, Jan. 1958, p. 26-29.

Calculation of the induction effect of live a.c. cable. Electrolytic effect. Relationship between the extent of the a.c. corrosion and the frequency and current density. Effects on electrodes made of open-hearth steel.

7163 High Temperature Aqueous Corrosion Product Films on Aluminum. V. H. Troutner. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-53389, Nov. 1957, 39 p. (UF767 Un3.1hw Contin.)

X-ray diffraction and optical and electron microscope studies of the inner and outer surfaces of Al corrosion product films ascertain what changes in the film cause or accompany the change from uniform to intergranular corrosion.

7164 Corrosion Inhibition on Tubes in Low-Pressure Steel Boilers. W. A. Keilbaugh and F. J. Pocock. *Heating, Piping & Air Conditioning*, v. 30, Feb. 1958, p. 129-135.

Sodium molybdate, NaOH, a buffered chromate compound, and a borate-nitrate-nitrite compound were evaluated as inhibitors.

7165* (English.) **Studies on the Corrosion of 13% Chrome Steel.** Ryocho Wada. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1957, p. 471-490.

A major cause of the excellent corrosion resistance of an Fe-Cr alloy containing more than 13% Cr is the rapid decrease of the critical current density required for its passivation. A logarithmic relation is found between the critical current density for passivation in 0.05 *N* HNO_3 and mole fraction of the alloy.

7166* Accelerated Corrosion Testing of Chromium-Plated Articles—Sulphur Dioxide Test. J. Edwards. *Institute of Metal Finishing, Bulletin*, v. 7, Winter 1957-1958, p. 55-78.

A room temperature test in an atmosphere containing approximately 1% by volume SO_2 at a relative humidity above 95% is suitable for testing a variety of coatings on steel and probably on other basis metals.

7167 A Potentiostat Technique for Studying the Acid Resistance of Alloy Steels. C. Edeleanu. *Iron and Steel Institute, Journal*, v. 188, Feb. 1958, p. 122-132.

A number of properties, included in the general term "acid resistance" are defined, measured, and compared by means of a potentiostat technique.

7168 The Relationship Between Magnesium Content and Stress-Corrosion Susceptibility of Aluminium-Magnesium Alloys. W. J. Vance. *Journal of Applied Chemistry*, v. 8, Jan. 1958, p. 18-23.

The susceptibility to stress-corrosion cracking of commercial purity Al-3.5% Mg and Al-2.25% Mg alloys was determined by corroding strain-aged 16 s.w.g. wire specimens by intermittent immersion in buffered 3% NaCl solution. Susceptibility values were 18.4 and 0% respectively. Results suggest that susceptibility is proportional to alloying Mg content.

7169 Effects of Irradiation on Corrosion Resistance of Some High Uranium Alloys. Sherman Greenberg and Joseph E. Draley. *Nuclear Science and Engineering*, v. 3, Jan. 1958, p. 19-28.

Three corrosion resistant U base alloys were corrosion-tested in high temperature water: U-5% Zr-1½% Nb, U-3% Nb-0.5% Sn, and U-3.8% Si. Only U.3.8% Si alloy retained any degree of corrosion resistance after burnups in excess of 0.1 at.%.

7170 Salt Spray Testing of Tinplated Copper. I. Corrosion Measurement by Chemical Porosity Test. Martin S. Frant. *Plating*, v. 45, Feb. 1958, p. 157-160.

Correlation of visual results with the porosity test, and examples of its use in determining corrosion rates, comparing various types of salt-spray, determining the effect of plating thickness on corrosion resistance, comparing different plating solutions, and the effect of reflowing (melting) the tin coating.

7171* Alkaline Digestor Corrosion. J. J. Wegerif. *Pulp and Paper Magazine of Canada*, v. 59, Jan. 1958, p. 104-108.

Combatting digester corrosion involves investigation into the causes of corrosion, repair, and prevention.

7172 (French.) Contribution to the Study of Erosion Due to Friction in the Field of Hydraulic Turbines. **Contribution à l'étude du phénomène d'érosion par frottement dans le domaine des turbines hydrauliques.** T. Bovet. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, no. 12, Dec. 1957, p. 377-388.

Deterioration of essential elements in the main types of hydraulic turbines, and measures for preventing this deterioration.

7173* (Italian.) Effect of the Induction Period in Reduction With Hydrogen on the Products of Oxidation at High Temperature of Metallic Iron. **Sul periodo di induzione nella riduzione con idrogeno sul prodotti di ossidazione ad alta temperatura del ferro metallico.** Agostino Borgone and Vittorio Gottardi. *Tecnica Italiana*, v. 22, no. 7, Oct.-Nov. 1957, p. 449-455.

7174* (Norwegian.) Dissolution of Metals—Especially Iron and Mild Steel in Acid. **Oppløsning av metaller—spesielt jern og bløtt stål i syre.** Tor Hurlen. *Teknisk Ukeblad*, v. 105, no. 5, Jan. 30, 1958, p. 95-101; no. 6, Feb. 6, 1958, p. 119-122.

A study of H-developing corrosion types, based on electrochemical theory. Kinetics of the electrode reactions. Anodic soltuion of iron. Cathodic development of pH.

7175 Corrosion Testing of Zircaloy-2 and Zircaloy-3. S. Kass. *Westinghouse Electric Corporation, Bettis Plant, (U. S. Atomic Energy Commission)*, WAPD-TM-97, Oct. 1957, 32 p. (UF767 Un3.1wa Contin.)

External factors influencing corrosion behavior were studied.

7176* (Russian.) Elimination of H_2O_2 by Metals as a Criterion of Atmospheric Corrosion. **Vydelenie H_2O_2 metallami kak kriterii atmosfernoi korrozii.** I. L. Roikh and D. M. Rafalovich. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2733-2738 + 1 plate.

Photographic method for obtaining the rate curves of H_2O_2 generation by freshly cleaned Al and Zn. Different stages of the oxidation of metals correspond to the amount of H_2O_2 released and to the thickness of the oxide layer.

See also: **6397** (rust preventive mahogany sulfonates); **6398** (corrosion of steel and Al in H_2O_2); **6401** (corrosion of petroleum refining equipment); **6651** (dissolution of dingot uranium in HNO_3); **6704** (corrosion of linings for steel shipping containers); **6803** (Cu electrode potentials); **7310** (oxidation of Cr-Mn-C-N steels); **7675** (corrosion resistance of rubber).

METALS—EXTRACTION AND REFINING

7177 Open Hearth Instrumentation. *American Iron and Steel Institute, Contributions to the Metallurgy of Steel*, Dec. 1957, 11 p. (TN705 Am35c Vis.)

Deals specifically with furnace pressure control, combustion control, temperature measurement, and automatic reversal systems.

7178 Steel Made by Basic Oxygen Process at Aliquippa. *Blast Furnace and Steel Plant*, v. 46, Feb. 1958, p. 205 + 2 pages.

Description of process by which it is possible to produce steel low in N, P, and S, and which is characterized by high purity and ductility. One of the innovations is installation of a system for preventing air pollution from the new furnaces.

7179 Effect of Reducibility of Self-Fluxing Sinter on the Working of the Blast Furnace. A. M. Bannykh and A. G. Neyasov. *Henry Brutcher Translation No.* 4014, 20 p. (From *Stal'*, v. 15, no. 11, 1955, p. 963-968.) Henry Brutcher, Altadena, Calif.

Effect of finer grinding of iron ore, limestone, and coke upon reducibility and strength of self-fluxing sinter. Results of improved reducibility: lowering of direct, and increasing of indirect, reduction in the blast furnace; lower coke rates; possibility of using a hotter blast.

7180 Effect of Heating of the Blast Upon the Working of a Blast Furnace. I. G. Boichenko. *Henry Brutcher Translation No.* 4051, 15 p. (From *Stal'*, v. 17, no. 6, 1957, p. 483-486.) Henry Brutcher, Altadena, Calif.

Ways of controlling temperature of oxidizing zone. Effect of temperature of blast on specific coke rate, volume of gases formed, and ultimately on furnace production.

7181 Vacuum Metallurgy of Steel. Deoxidation and Desulfurization in Vacuum. G. A. Garnykh and A. M. Samarin. *Henry Brutcher Translation No.* 4054, 12 p. (Condensed from *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1957, no. 5, May, p. 77-84.) Henry Brutcher, Altadena, Calif.

Effect of reduced pressures on C and S elimination in production of transformer steel in vacuum induction furnaces.

7182 Mechanism of Formation of Zirconium Sponge in the Magnesiothermal Production of Zirconium. F. G. Reshetnikov and E. N. Oblomeev. *Henry Brutcher Translation No.* 4055, 7 p. (Abridged from *Atomnaia Energiia,* v. 3, no. 5, 1957, p. 459-462.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 13438, v. 6, Sept. 1957.

7183 Heat Checking of Ingot Molds. N. I. Pavlovtseva and L. M. Cherkasov. *Henry Brutcher Translation No.* 4062, 13 p. (From *Stal',* v. 17, no. 9, 1957, p. 800-804.) Henry Brutcher, Altadena, Calif.

Checking is probably due to triaxial tensile stresses in the surface layer during cooling of the molds. Alloying of Fe with Cr increases the soundness of the wall, decreases scaling and growth in service, retards checking and wear of the internal surface of the molds.

7184 On the Reduction of Hematite by Solid Carbon. K. Shimanaka, et al. *Henry Brutcher Translation No.* 4064, 3 p. (From *Tetsu to Hagané,* v. 43, no. 9, 1957, p. 1017.) Henry Brutcher, Altadena, Calif.

Reduction with silica and powdered charcoal in vacuum without access of O and in air in the presence of CO_2 formed by C combustion at 800-1300 C.

7185 Zone Melting and Crystal Pulling Experiments With AlSb. W. P. Allred, Bernard Paris, and M. Genser. *Electrochemical Society, Journal,* v. 105, Feb. 1958, p. 93-96.

High-resistivity AlSb ingots resulted from zone refining in Al_2O_3 crucibles. Most of the impurities segregated readily to the rear. Resistivity and Hall coefficients were determined for single-crystals cut from a zone-refined ingot. Comparison of these crystals with those grown by the Czochralski technique indicated that the growth of high-purity crystals is limited by the purity of the alumina crucible and the Al.

7186* (Czech.) Pre-Refining of Basic Bessemer Pig Iron With Oxygen. **Předzkujňování oceláreského surového železa Thomasova kyslíkem.** Luděk Kodrle. *Hutnické Listy,* v. 12, no. 12, Dec. 1957, p. 1070-1077.

Summary of results on basic Bessemer pig iron with a wide range of Mn and Si content performed without slag treatment. The pre-refining of pig iron of specific composition appears economic if a decrease of 0.2% Si, 0.9% Mn, and 0.1% C was obtained.

7187 Production of Hafnium. I. H. P. Holmes, M. M. Barr, and H. L. Gilbert. *Industrial Heating,* v. 25, Jan. 1958, p. 44 + 4 pages.

Occurrence and modes of separation. Preliminary investigation of Hf metal by the Kroll process. (To be continued.)

7188 (French.) Continuous Softening of Pig Iron in the Main Runner of the Blast Furnace by Blowing Pure Oxygen Through Porous Slabs. **Préaffinage continu de la fonte dans le chenal du haut-fourneau par soufflage d'oxygène pur à travers des dalles poreuses.** P. Leroy and R. Simon. *Institut de Recherches de la Sidérurgie, Publications,* ser. A, no. 172, Dec. 1957, p. 1-20. (Reprinted from *Revue de Métallurgie,* v. 54, no. 10, Oct. 1957, p. 793-812.) (TN602 In7p Vis.)

Permeability, refractoriness and wear resistance of slabs at high temperature. Elimination of reddish smokes. Decrease of Si and Mn contents. Effect of the blast density. Iron losses in the slags obtained.

7189 Blast Furnace Instrumentation. D. W. Gillings. *Instruments and Automation,* v. 31, Feb. 1958, p. 256-259.

Current practice and attempted instrumentation for control of blast furnaces in Britain.

7190 Programming Open-Hearth Combustion. L. W. Eisenhart. *Instruments and Automation,* v. 31, Feb. 1958, p. 260-264.

Open-hearth instrumentation and programmed combustion control at U. S. Steel's Fairless Works.

7191 Modern Open Hearth Control. Robert L. Sigl. *Instruments and Automation,* v. 31, Feb. 1958, p. 265-266.

Hydraulic combustion, pneumatic reversal, and electric temperature control are combined in this open-hearth that tapped its first heat in 1954.

7192 Russian Experience With 500-Ton Open Hearth Furnaces. R. Sewell. *Iron & Steel,* v. 31, Feb. 1958, p. 61-62.

Basic dimensions and sectional drawings of a Russian furnace. Operation and results of the first campaign.

7193 Techniques in Rebuilding a Blast Furnace. C. F. Bessent. *Iron and Steel Engineer,* v. 35, Feb. 1958, p. 82-94.

Complete details of furnace teardown and rebuild operations.

7194* Bibliography on the Continuous Casting of Steel, 1933-1957. *Iron and Steel Institute, Bibliographical Series No.* 21, 1957, 21 p. (ZTS300 Ir6b Ref.)

7195 A Thermodynamic Study of Fe-Ca-P-O, Fe-Ca-Si-P-O, and Some Complex Molten Silicophosphate Systems. E. T. Turkdogan and Patricia M. Bills. *Iron and Steel Institute, Journal,* v. 188, Feb. 1958, p. 143-153.

7196* (Russian.) The Reduction of Silica by Carbon With Alternating Pressure of the Gas Phase. **Vosstanovlenie kremniia uglerodom pri peremennom davlenii gazovoi fazy.** I. P. Bardin and V. M. Shchedrin. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* 1957, no. 11, Nov., p. 27-43 + 1 plate.

Reduction of SiO_2 by C to SiO and the decomposition of the gas-like SiO on the surface of the C to form free Si. The coefficient of Si activity is determined.

7197 A Filtration and Vacuum Distillation Unit for the Purification of Alkali Metals. G .W. Horsley. *Journal of Applied Chemistry,* v. 8, Jan. 1958, p. 13-18.

Operating data for the preparation of distilled Li, Na, and K are given.

7198 Use of Fusite in Desulphurizing Off-Grade Pig Iron. J. Goswami, A. B. Chatterjea, and B. R. Nijhawan. *Journal of Scientific & Industrial Research,* v. 16, sec. A, Nov. 1957, p. 522-526.

Desulfurization in acid lined ladles was erratic due to the interaction of Fe and/or MnS from the acid lining; the efficiency of desulfurization in basic lined ladle is determined by initial S content. Physical properties of the pig iron were improved.

7199* (Hungarian.) The Production of Germanium From the Gas Phase by Way of Germanium Hydride (GeH_4). **Germánium előállítása gázfázisból germániumhidriden (GeH_4) keresztül.** Ferenc Csapō, István Bihari, and Lajos Vecsernyés. *Magyar Kémikusok Lapja,* v. 12, no. 1, Jan. 1957, p. 33-34.

Production of very thin Ge films and accurate alloys, as well as monocrystals from the gas phase by Ge^{++}-sulfuric acid electrolysis.

7200* (German.) Refining of Molten Waste Lead. **Die Verkrätzung von flüssigem Blei.** E. Pelzel and H. Schneider. *Metall,* v. 12, no. 2, Feb. 1958, p. 122-124.

Oxidation of rimming and killed melts; the influence of Sb on the oxidation reaction of molten Pb.

7201* (Russian.) Carbon Blocks in Blast Furnace Lining. **Uglerodistye bloki v kladke domennykh pechei.** A. N. Red'ko. *Metallurg,* v. 3, no. 1, Jan. 1958, p. 7-10.

Prevention of caking in the furnace and uneven sinking of the charge. Durability of the carbon blocks was determined by measuring the thickness of the lining.

7202* (Russian.) Reduction of Contamination of Rimmed Steel Caused by Non-Metallic Inclusions. **Umen'shenie zagriaznennosti kipiashchei stali nemetallicheskimi vkliucheniami.** D. S. Gerchikov. *Metallurg,* v. 3, no. 1, Jan. 1958, p. 15-17.

Investigation by mean of radioactive isotopes. Development of measures forelimination of the contamination. Selection of optimum method of deoxidation. Application of a fluxing mixture to increase the slag fluidity. Chemical composition of fluxing additions and their effect on the change of slag (slag froth) chemical composition.

7203* (Russian.) Deoxidation of Rail Steel by a Reduced Amount of Aluminum. **Raskislenie rel'sovoi stali umen'shennym kolichestvom aliuminiia.** N. I. Shirokov and B. G. Petukhov. *Metallurg*, v. 3, no. 1, Jan. 1958, p. 17-21.

Two variants of preliminary deoxidation processes of experimental meltings with reduced Al content (300 and 200 g/ton). Best results were obtained with the lower Al content.

7204* (Italian.) The Reactions of Carbon and Sulphur and the Metal-Slag Balance in Steel Refining With Oxidizing Slag. **Le reazioni del carbonio e dello zolfo e l'equilibrio metallo-scoria nell'affinazione dell'acciaia con scoria ossidante.** G. Violi. *Metallurgia Italiana*, v. 49, no. 12, Dec. 1957, p. 805-816.

Oxygen in steel and the C-O equilibrium. Distribution of O in slag and pure Fe. Mechanism and kinetics of carburation. Metal-slag equilibrium and decarburation. Desulphurization refining with oxidizing slag. Sulfur distribution and the C-O balance.

7205* (German.) The Production of High-Grade Steels by Means of a Slag Reaction Alloying Process and Its Results. **Die Edelstahlerzeugung nach einem Schlackenreaktions-Legierungsverfahren und ihre Ergebnisse.** Hans-Joachim Eckstein. *Neue Hütte*, v. 2, no. 12, Dec. 1957, p. 737-749.

Combined processes used in steel production; metallurgy of the slag-alloying process; quality tests; operating results.

7206 (German.) Smelting Trials With Swedish Ore Pellets. **Verhüttungsversuche mit Schwedenerz-Pellets.** Alfred Reckmann and Walter Misch. *Stahl und Eisen*, v. 78, no. 1, Jan. 9, 1958, p. 21-27.

Production, investigation on polished sections, and reducibility of the pellets. Smelting trials on a comparative basis in the blast furnace using crude ore, pellets, and sinter. Experimental results.

7207 (German.) Desulfurization in the Basic Open-Hearth Furnace. **Die Entschwefelung im basischen Siemens-Martin-Ofen.** Karl-Georg Speith, Hans vom Ende, and Gustav Mahn. *Stahl und Eisen*, v. 78, no. 1, Jan. 9, 1958, p. 27-34.

Effect of Mn content and temperature on the S content of the first sample after initial melting. Desulfurization during the boiling period in melting with or without reduction of Mn; S content during tapping. Effect of slag composition in desulfurization under oxidizing slags.

7208 (German.) Desulfurization in the Basic Steel Converter. **Die Entschwefelung im Thomaskonverter.** Karl-Georg Speith, Hans vom Ende, and Hans Vosskötter. *Stahl und Eisen*, v. 78, no. 3, Feb. 6, 1958, p. 152-156.

Theoretical considerations. Desulfurization as dependent on the CaO/SiO_2 ratio of the slag. Role of slag FeO content in the desulfurizing process, and its effect on repartition of the S between the steel bath and the slag.

7209 (German.) Use of Oxygen in an Open-Hearth Steel Plant. **Anwendung von Sauerstoff in einem Siemens-Martin-Stahlwerk.** Wilhelm Gerling and Karl-Otto Zimmer. *Stahl und Eisen*, v. 78, no. 3, Feb. 6, 1958, p. 156-160.

Addition of O into the gas producers; O enrichment of the combustion air in the open-hearth furnace, particularly in furnaces of the older type, in order to retain furnace efficiency. Increasing melting rate by using O lances, particularly for cutting and melting big pieces. Oxygen lance to accelerate desulfurization and decarburization of steels low in carbon.

7210 Vacuum Melting. Wallace E. Britton, et al. 136 p. 1957. Frank D. Jacobs Co., Philadelphia. (TN686 V13)

History of vacuum melting; process details; properties and uses of vacuum melted metals; economic factors.

7211* (German.) The Settling Behavior of Copper Matte and Copper in Liquid Slags. **Das Absetzverhalten von Kupferstein und Kupfer in flüssigen Schlacken.** Friedrich Johannsen and Wilfried Wiese. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 11, no. 1, Jan. 1958, p. 1-15.

Composition of Cu slags in the system $FeO\text{-}CaO\text{-}SiO_2$. Viscosity of slags, stones, and metallic Cu. Specific gravities. Particle sizes of Cu and sulfides in raw materials. Size change during smelting and settling.

See also: **6390** (pyrometallurgical separation of U and Th); **6391** (separating Hf and Zr with tributyl phosphate); **7127** (European steelmaking methods and equipment).

METALS—FINISHING, POLISHING, AND CLEANING

7212* (Spanish.) The Degreasing of Metals. **El desengrasado de los metales.** Luis Mauri. *Acero y Energia*, v. 14, no. 84, Nov.-Dec. 1957, p. 52-58.

A survey of the different degreasing processes. Classification of the apparatus used and the products applied; inorganic, surface-active, and aqueous solutions; electrolytic degreasing; neutral solutions; emulsions.

7213 An Improved Method of Flame De-Scaling for Spot Welding: An Application of Oxy-Acetylene Flame De-Scaling for the Preparation of Normal Rolling-Mill Products for Spot Welding. M. Evrard. *British Welding Journal*, v. 5, Feb. 1958, p. 57-65.

7214 Some Aspects of Cleaning Prior to Metal Finishing. Bruce Whitehead. *Electroplating and Metal Finishing*, v. 11, Feb. 1958, p. 35-42.

Types of soil; methods of specifying the degree of cleanliness required; methods of cleaning; agitation methods; ultrasonic cleaning.

7215* (French.) Thermal Oxidation of Cast Iron From the Point of View of Its Aptitude to Vitreous Enameling. **Oxydation thermique de la fonte en relation avec son aptitude a l'émaillage au poudré.** Roland Piva. *Fonderie*, 1957, no. 143, Dec., p. 533-544.

A study of the effect of the degree of oxidation of a ferrous metal on the enamel adhesiveness. Rate of hot oxidation as function of surface preparation. Speed of attack in a sulphuric medium. Adhesiveness of enamel as function of rate of oxidation after chemical cleaning.

7216* (French.) A Critical Study of the Chemistry of Continuous Pickling. **Étude critique de la chimie du décapage en marche continue.** G. de Lattre. *Génie Chimique (Supplement to Chimie & Industrie)*, v. 79, no. 1, Jan. 1958, p. 23-26.

Deficiencies of the technique involving the study of solubility of the ferrous sulfate formed in the bath as a function of the H_2SO_4 concentration and the temperature. The technique does not allow for the changes in the solubility of ferrous sulfate. Standardizing the process using a mixture of H_2SO_4 and HNO_3.

7217 (German.) The Removability of Scale From Steel Plates. **Die Entfernbarkeit des Zunders von Stahlblechen.** Wilhelm Rädeker and Max Wild. *Stahl und Eisen*, v. 78, no. 2, Jan. 23, 1958, p. 100-103.

Pickling, sand blasting, cleaning with burner, and natural weathering were used for the removal of scale from different steel plates.

See also: **7000** (ultrasonic cleaning); **7416** (assessment of surface finish); **7664** (utilization of line sludge from neutralized spent pickle liquor).

METALS—FOUNDRY PRACTICE

7218* **The Influence of Sulphur on the Castability, Tensile Properties, and Pressure Tightness of Sand-Cast Bronzes and Gunmetals.** H. Reiter. *British Foundryman*, v. 51, pt. 1, Jan. 1958, p. 2-10.

Sulfur contents up to 0.3% had no harmful effects.

7219* Surface Finish for Non-Ferrous Castings. *British Foundryman*, v. 51, pt. 1, Jan. 1958, p. 17-35.

Influence of numerous metal and mold variables on surface finish. Results show predominant influence of fineness of the sand and of its degree of ramming.

7220 Effect of Process Variables Upon the Design of Centrifugal Pipe-Casting Machines. A. A. Mikhel'son. *Henry Brutcher Translation No.* 4016, 16 p. (From *Stal'*, v. 16, no. 4, 1956, p. 348-351.) Henry Brutcher, Altadena, Calif.

7221* (Italian.) The Use of Tellurium in the Iron Foundry. **l'Impiego del tellurio nella fonderia di ghisa.** *Fonderia*, v. 6, no. 12, Dec. 1957, p. 529-530.

Tellurium, an energetic carbide stabilizer, causes the formation of a hard tempered zone, with or without the use of an iron mold. Different ways to use Fe, especially with Cu. Effects on cast iron with low, average, or high resistance. Superficial hardening by means of Te coating. Tellurium graphite additions.

7222* (French.) Determining the Feeding Sections of Sand Mold Castings. **Détermination des sections de l'alimentation de pièces coulées en sable. I.** Charles Trencklé. *Fonderie*, 1957, no. 143, Dec., p. 551-571.

Hydrodynamic laws concerning the flow of molten metals. Flow resistance in the mold. Continuous flow in feeding systems. Viscosity and friction against the walls when section is constant. Heat loss due to change of section.

7223* (French.) Calculation of the Channel Connecting the Riser and the Casting in Mold Casting. **Calcul de l'attache masselotte-pièce dans la coulée en sable.** Richard Namur. *Fonderie Belge*, 1958, no. 1, Jan., p. 8 + 5 pages.

In order to obtain correct feeding of the metal during solidification, a calculation of the connecting channel was made involving the smallest transversal dimensions of the channel, the distance from riser to the casting, and the diameter of the typical riser used.

7224* (French.) Critical Study of the Advantages of the CO_2 Process. **Examen critique des avantages du procédé au CO_2.** J. E. O. Little *Fonderie Belge*, 1958, no. 1, Jan., p. 18-19.

Elimination of defects due to stoving and drying; economy of labor; space gains; reduction of casting defects; use of any mixer or crusher. Applications.

7225 Shrinkage in Tin Bronze. Clyde L. Frear. *Foundry*, v. 86, Feb. 1958, p. 92-97.

Emphasizes that troubles can be minimized if everything coming in contact with the metal is kept dry. Recommends a fracture test bar to determine the amount of gas present.

7226 Sodium-Silicate Bonded Shell Molds. P. J. Ahearn and G. I. Gartner. *Foundry*, v. 86, Feb. 1958, p. 98-101.

Use of inorganic binders in place of resin as bonding agent in shell molds.

7227 Surface Finish of Steel Castings. David V. Atterton. *Foundry*, v. 86, Mar. 1958, p. 92-95.

Depth of sand penetration by molten metal. Surface finish in relation to new molding materials and techniques.

7228 Metallurgical Aspects of Hot-Tearing in Cast Steel. Kurt Beckius. *Foundry Trade Journal*, v. 104, Jan. 30, 1958, p. 115-123.

Casting experiments in an apparatus designed on the resistance-spring principle. Comparison of time/contraction curves with occurrence of tearing as manifested in macro-etched, tear-containing sections of cast test-bars. Temperature measurements during cooling and solidification. Relationship between solidification process and hot-tear formation. (To be continued.)

7229 Comparative Study of the Effect of Starches and Moisture in Facing Sand. D. K. Southwick. *Foundry Trade Journal*, v. 104, Jan. 23, 1958, p. 91-92.

Research in the field of starch binders in foundry practice.

7230* (German.) The Castability of Some Alloys With High Nickel Content and Other Nickel Alloys. **Die Vergiessbarkeit einiger hochnickelhaltiger und anderer nickelhaltiger Legierungen.** D. R. Wood and J. F. Gregg. *Giesserei*, v. 45, no. 2, Jan. 16, 1958, p. 33-42.

Castability tests and how they are carried out. Tests with an Inconel alloy and verification of test results by commercial castings made of Inconel. Tests with other Ni alloys. Significance of results.

7231* (German.) Contribution to the Production of Very Large Steel Castings of 13% Chromium Steel. **Herstellung von sehr grossen Stahlgussstücken aus 13prozentigem chromstahl.** Georg Schmidt. *Giesserei*, v. 45, no. 2, Jan. 16, 1958, p. 43-47.

Development of the production of steel castings from small and medium weights per piece to heavy pieces of extreme size with a cast weight of about 120 tons of liquid steel.

7232* (German.) Defects and Faults in the Manufacture and Operation of Pressure-Casting Dies. **Mängel und Fehler bei der Herstellung und im Betrieb von Druckgiessformen.** Gustav Lieby. *Giesserei*, v. 45, no. 3, Jan. 30, 1958, p. 60-64.

Technical, economical, and operational difficulties in manufacturing pressure-casting molds, and possible ways to overcome them.

7233 (Swedish.) Design of Castings With Regard to Molding. **Gjutgodsets konstruktion med hänsyn till formningen.** Alrik Östberg. *Gjuteriet*, v. 47, no. 12, Dec. 1957, p. 197-203.

Choice of parting line; importance of a straight parting line; recommendations on dimensioning for castings; parting and draft relationships; orientation of projecting parts of the casting, substitution of rib reinforcements by other means.

7234 Application of Risers With High Atmospheric Pressure. W. P. Desnizki. *Iron & Steel*, v. 31, Feb. 1958, p. 51-52.

(Translated from the Russian.) Steel castings production under the application of compressed air to the molten steel surface. Method induces intensive flow of steel and leads to a better yield of good steel. Simple apparatus and the existence of compressed air supplies in all foundries make this method suitable for widespread application. Large castings of simple shape are the most favorable for this technique.

7235* (Russian.) Production of Steel Castings With an Exothermic Riser Pattern. **Proizvodstvo stal'nykh otlivok s ekzotermicheskimi nastavkami dlia pribylei.** I. M. Barabash and A. S. Shuper. *Liteinoe Proizvodstvo*, 1957, no. 12, Dec., p. 4-5.

Preparation of exothermic pattern to keep the metal in the riser in a liquid state, to decrease the volume and weight of the riser, and to improve the quality of casting.

7236* (Russian.) Wear-Resisting Cast Iron Grinding Media for Mills. **Iznosostoikie chugunnye meliushchie tela.** O. A. Nesvizhskii. *Liteinoe Proizvodstvo*, 1958, no. 1, Jan., p. 5-6.

Production of cast iron for casting grinding balls and cylinders. Microstructure, chemical composition, and microhardness.

7237* (Russian.) Application of Artificially Ground Sands in Manufacture of Shell Molds. **Primenenie iskusstvenno izmel' chennykh peskov dlia obolochkovoi formovki.** V. I. Ivanov and E. P. Tolmachev. *Liteinoe Proizvodstvo*, 1958, no. 1, Jan., p. 8-10.

Chemical and grain size composition of various types of sands used in experimental shell mold casting. All castings cast into shell molds manufactured from sands which were 56.40%-270 mesh show a smooth and clean surface, without sand crust pickup. Characteristics and design of vibrating mills for sand grinding.

7238* (Russian.) New Method for Transportation of Used Sand in Foundry Industry. **Novyi sposob peremeshcheniia goreloi zemli v liteinom proizvodstve.** A. S. Trofimov and V. M. Poliakov. *Liteinoe Proizvodstvo*, 1958, no. 1, Jan., p. 14-16.

Pneumatic transportation of molding materials and used sands. Calculation, design, operation, and advantages of such installation.

7239 Investment Casting of Precious Metal Jewelry. Ralph H. Atkinson. *Metal Progress*, v. 73, Feb. 1958, p. 97-101.

Melting and casting methods for Pt, Pd, Ag, and Au.

7240* (Czech.) Production of Chilled Rolls by Partial Casting. **Výroba tvrzených válců částečným prolévánim.** Robert Kamenský. *Slévárenství*, v. 5, no. 12, Dec. 1957, p. 359-364.

Principles of partial casting method increasing the depth of chilled layer without decreasing strength. Properties and microstructure of testing rolls.

See also: **7125** (ferrous castings); **7248** (effect of Bi and B on annealing of white iron).

METALS—HEAT TREATMENT

7241* Quenching and Quenching Media. B. F. Russell. *Australasian Engineer*, v. 50, Jan. 1958, p. 70-80.

Fundamentals of steel quenching; the martensite transformation; the concept of hardenability and its application; properties and applications of various quenching media.

7242 Low-Temperature Nitriding of [Alloy] Structural Steels. R. I. Mishkevich, P. I. Solntsev, and A. V. Smirnov. *Henry Brutcher Translation No.* 4046, 9 p. (Abridged from *Metallovedenie i Obrabotka Metallov*, 1957, no. 2, Feb., p. 49-54.) Henry Brutcher, Altadena, Calif.

Investigates possibility of nitriding steel below 400 C instead of at 500-600 C, without inducing temper brittleness in core, in the presence of ferrosilicon to increase the degree of dissociation of ammonia and with chromic anhydride to increase the surface temperature of the stock.

7243 How to Increase the Output of Vacuum Annealing Furnaces for Transformer Sheet. M. M. Ioffe and S. M. Popov. *Henry Brutcher Translation No.* 4053, 4 p. (From *Stal*, v. 17, no. 10, 1957, p. 948.) Henry Brutcher, Altadena, Calif.

7244 Prevention of Decarburization of Alloy Steels During Annealing in Controlled Atmospheres. K. V. Dneprenko and M. M. Ioffe. *Henry Brutcher Translation No.* 4058, 7 p. (From *Stal'*, v. 17, no. 10, 1957, p. 934-935.) Henry Brutcher, Altadena, Calif.

Decarburization in industrial furnaces can be practically eliminated by evaporating benzene into the controlled atmosphere, or by passing the gas through a bed of wood charcoal heated to 1000 C, or in a gas freed from H_2S and CO_2.

7245* Double Heat Treatment Produces Tough Freight Car Wheels. Larry DeBoer. *Industrial Gas*, v. 36, Feb. 1958, p. 10-12.

Solution heat treatment diffuses carbides into grains, and a spheroidizing treatment puts cast wheel in a state of high strength and toughness; structure is easy to machine.

7246 Applications of Furnace Atmospheres. III. Atmospheres for Brazing and Sintering and for Non-Ferrous Heat Treatments. C. E. Peck. *Industrial Heating*, v. 25, Jan. 1958, p. 56 + 4 pages.

(To be continued.)

7247* (Russian.) Effect of the Cyclic Heat Treatment on Copper, Nickel, and Certain Copper-Base Single-Phase Solid Solutions. **Effect tsiklicheskoi termicheskoi obrabotki v medi, nikele i nekotorykh odnofaznykh tverdykh rastvorakh na mednoi osnove.** A. A. Bochvar and E. B. Brovchenko. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 11, Nov., p. 10-13.

The experiment was conducted identically on samples made of pure Cu, Ni, and Cu-Ni, Cu-Zn, and Cu-Ni-Zn alloys.

7248* (Russian.) Effect of Bismuth and Boron on Decreasing Annealing Time of White Iron. **Vliianie vismuta i bora na sokrashchenie otzhiga belogo chuguna.** I. F. Kurtov, V. A. Zakharov, N. P. Chichagova, and S. V. Riabokon'. *Liteinoe Proizvodstvo*, 1957, no. 12, Dec., p. 20-21.

Experiments show that the joint introduction of small additions of Bi and B (other conditions being the same) into cast iron permits decrease of annealing time of white iron 25-35%, simplifying production of malleable cast iron with a structure of granular pearlite, and an expansion of the possibilities of use of malleable cast iron as construction material.

7249* Salt Bath Materials and Methods. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 65-66.

A review of current practice and notes on some recent developments.

7250* (Russian.) Molten Metals and Alloys as a Medium for Heating of Steel Articles Requiring Heat Treatment. **Rasplavlennye metally i splavy kak sreda dlia nagreva stal'nykh izdelii pri termicheskoi obrabotke.** A. P. Garashchenko, A. P. Guliaev, and Z. S. Luneva. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 21-26.

Use of Al alloy with 8 to 12% Si for heating of parts for annealing, and Al with 6 to 10% Si and 5 to 7% Fe for heating for hardening.

7251 Automation in Heating and Quenching. Norbert K. Koebel. *Metal Progress*, v. 73, Feb. 1958, p. 72-78.

Deals with the more complex operations, primarily in a controlled atmosphere or salt bath.

7252 Heating at High Speed. Norman H. Davies and Richard J. Reed. *Metal Progress*, v. 73, Feb. 1958, p. 79-84.

Physical laws governing heat transfer; high thermal-head heating; arrangements of heat source and work; advantages and disadvantages of high-speed heating; convection vs. radiation.

7253 Salt Baths and Salt Bath Furnaces. Haig Solakian. *Metal Treating*, v. 9, Jan.-Feb. 1958, p. 4 + 3 pages.

Types of salt baths for use in the 300-1150 and 1200-1800 F temperature ranges. Suitable furnaces for the 300-1150 F range. (To be concluded.)

7254* Method and Furnace Types for Annealing Transformer Steel Sheet. Werkwijze en oventypen voor het gloeien van transformatorplaat. C. H. Luiten. *Smit Mededelingen*, v. 12, no. 4, Oct.-Dec. 1957, p. 137-142.

Nitrogen with 10% H is the atmosphere of choice as it provides slightly oxidizing conditions. Carbon pick-up must be prevented. For annealing wound cores, a pit-type furnace with gas-tight retort is advised.

7255 One Furnace Does Three Jobs. *Steel*, v. 142, Feb. 24, 1958, p. 74-75.

Furnace carbonitrides, clean hardens, and straight hardens. Cast alloy fixtures resist severe temperature changes and gas atmospheres. Equipment requires only one operator.

7256* Pack Chromizing Method Hikes Heat, Wear, Corrosion Resistance on Varied Components. Maurice C. Commanday. *Western Metalworking*, v. 16, Jan. 1958, p. 46-48.

Parts to be chromized are packed in a box-type retort prior to being furnace heated. A compound of kaolin or alumina diluent, ferrochromium, and NH_4I is used and box is sealed by fusible silicate powder.

See also: **7302** (heat treatment of heat-resisting alloys); **7326** (heat treatment of bearings); **7382** (heat treatment of steel); **7389** (induction heating of steel bars).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

7257* (English.) **Fatigue Tests on Basic-Bessemer and Open-Hearth Steels.** Alfred Funck. *Acier, Stahl, Steel*, v. 23, no. 1, Jan. 1958, p. 19-24.

Tests show no significant difference between fatigue strengths of these steels. There is strong correlation between fatigue and tensile strength.

7258 (English.) **The Effect of Preloading on the Yield Point in Iron.** M. M. Hutchison and N. Louat. *Acta Metallurgica*, v. 6, no. 1, Jan. 1958, p. 8-12.

Increase in yield stress below the yield point was examined to distinguish between current theories of the yield point in Cottrell locked systems. Results favor a model in which prior to yielding, the dislocations move significantly, carrying their atmospheres with them.

7259* (German.) Determination of Notch Toughness on Small Specimens. **Beitrag zur Bestimmung der Kerbzähigkeit mit Hilfe einer Kleinprobe.** Vladimí Komárek. *Acta Technica*, v. 3, no. 1, 1958, p. 26-57.

New shape of specimen giving results similar to the standard DVM specimen. Results obtained with DVM specimens are compared with results with small specimens of various types of steel at various temperatures, and development of a testing method.

7260 Electronic Specific Heat of Sodium Tungsten Bronze. Robert W. Vest, M. Griffel, and J. F. Smith. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-899, Mar. 1957, 75 p. (UF767 Un3.1is Contin.)

Design and operation of a calorimeter for use in the temperature range 1.8-4.2 K. Methods used in the treatment of data and calculation of results.

7261* Hall Coefficient of Technically Pure Metals From 80°K to 800°K. II. Results for Zr, W, Mo, Ta, Nb and Al. Survey of Results for the 4*d*- and 5*d*-Transition Group of Metals. V. Frank. *Applied Scientific Research*, v. 7, sec. B, no. 1, 1958, p. 41-51.

7262* (Polish.) Thermodynamic Properties of Liquid Metallic Solutions. **Własności termodynamiczne ciekłych roztworów metalicznych. I. The Ag-Pb System.** Układ Ag-Pb. Janusz Terpiłowski. *Archiwum Hutnictwa*, v. 2, no. 4, 1957, p. 289-304.

Fourteen liquid Ag-Pb alloys with 5 to 92.5% of Pb were investigated electrochemically. Activity and the coefficients of activity of the constituents were calculated for 1000 C.

7263 Influence of Various Grinding Conditions Upon Residual Stresses in Titanium. P. A. Clorite and E. C. Reed. *ASME, Transactions*, v. 80, Feb. 1958, p. 297-301.

Stresses were measured in Ti test bars, surface-ground with various wheels, speeds, grinding fluids, downfeeds, and crossfeeds. Results suggest that, with suitable precautions, Ti alloys may be ground under either near-normal or low-speed conditions with acceptable grinding ratios and with low residual stresses.

7264 Experience With Chromium-Molybdenum-Vanadium Steel in High-Temperature Bolting Applications. R. G. Matters and C. D. Dickinson. *ASME, Transactions*, v. 80, Feb. 1958, p. 330-334.

Chromium-Mo-V steels, ASTM A 196, grade B 14 or slight modifications of this material have been used widely for high-temperature bolting since about 1938. In the temperature range 850 to 1000 F these materials have significantly higher relaxation resistance than have the other ferritic steels covered by ASTM A 196. Service performance of Cr-Mo-V bolts in turbines operating with inlet steam temperatures below 1000 F has been generally satisfactory. However, within the past two years bolts have failed in two central station turbines. This paper covers the examination of the failed bolts, the analysis of the cause of failure, and recommendations to avoid failure of this type.

7265* Lattice Thermal Conductivity of Some Copper Alloys. W. R. G. Kemp, P. G. Klemens, and R. J. Tainsh. *Australian Journal of Physics*, v. 10, Dec. 1957, p. 454-461.

The high lattice thermal resistance at liquid He temperatures found in Cu-Zn alloys is a function of solute content rather than of concentration of conduction electrons, and can be reduced by high-temperature annealing. The lattice thermal conductivity of Cu-Au alloys at liquid O temperatures is limited by the scattering of phonons at the Au atoms, which are much heavier than the Cu atoms.

7266 Thermal and Temper Brittleness of Ferritic (Pearlitic) Steels. P. B. Mikhailov-Mikheev. *Henry Brutcher Translation No.* 3977, 22 p. (From *Metallovedenie i Obrabotka Metallov*, 1956, no. 2, Feb., p. 23-33.) Henry Brutcher, Altadena, Calif.

Characteristics, causes, and methods of detection.

7267 Apparatus for Measuring the Surface Tension and Density of Liquid Metals in Vacuum. N. L. Pokrovskii and M. Saidov. *Henry Brutcher Translation No.* 4011, 11 p. (From *Fizika Metallov i Metallovedenie*, v. 2, no. 3, 1956, p. 546-551.) Henry Brutcher, Altadena, Calif.

7268 Wear Resistance of Steel Surface-Impregnated With Carbide-Forming Elements. G. N. Dubinin. *Henry Brutcher Translation No.* 4015, 6 p. (From *Metallovedenie i Obrabotka Metallov*, 1957, no. 9, Sept., p. 21-25.) Henry Brutcher, Altadena, Calif.

Study of wear resistance of plain carbon steels (0.03 to 1.18% C) surface impregnated with Cr, V, Cb, W, Mo, and Mn.

7269* (French.) Magnetoelectric Properties in Thin Nickel Foils Magnetized to Saturation. **Propriétés magnétoélectriques des lames minces de nickel aimantées à saturation.** Thérèse Rappeneau. *Comptes Rendus*, v. 246, no. 4, Jan. 27, 1958, p. 571-574.

Foils obtained by thermal evaporation were studied at room temperature between 4000 and 8000 Oe. Relative variation of the electric resistance was determined as a function of the magnetic field and of the angle between field and currents.

7270* The Behaviour of Heat-Resisting Steels at High Temperatures Under Prolonged Loading. W. Stauffer and A. Keller. *Escher Wyss News*, v. 30, July-Sept. 1957, p. 17-32.

Long-time rupture strength, time-rupture, scale, hardness and impact-value tests on various steels are described.

7271 (Swedish.) The Scatter in Strength of Light Alloy Castings. **Spridningen i hållfasthetsegenskaper hos gjutgods av lättmetallegeringar.** F. Turner. *Gjuteriet*, v. 47, no. 12, Dec. 1957, p. 204-210.

Results of two years routine tests on specimens machined from light alloy castings in production for aircraft were collected and subjected to a statistical analysis. Two Mg alloys and two Al alloys are included. Demonstrates that different alloys should have different factors of safety.

7272* (Czech.) Effect of Manganese on the Magnetic Aging of Low Carbon Steel. **Vliv manganu na magnetické stárnutí nízkouhlíkové oceli.** Slavomír Hořejš. *Hutník*, v. 7, no. 12, Dec. 1957, p. 400-401.

Relationship between Mn content and magnitude of magnetic aging; and between Mn content and coercive intensity of low carbon steel.

7273 Fracture of Metals. Some Present-Day Thoughts on Crack Initiation and Propagation. W. D. Biggs. *Iron & Steel*, v. 31, Feb. 1958, p. 57-60.

Development of conditions for crack initiation at blocked slip bands, with brief consideration of the mechanism by which the crack can grow and propagate. Relationships between yield stress, fracture stress, and grain size; influence of O on fracture stress of Fe-O alloys; possible relationship between yield delay and fracture.

7274 The Nature of Strain-Age Embrittlement. C. J. Osborn. *Iron and Steel Institute, Journal*, v. 188, Feb. 1958, p. 97-101.

Curves showing the progress of embrittlement with time of aging a low-carbon iron at 30 and 80 C closely resemble the corresponding strain-age hardening curves, and suggests that embrittlement and hardening are due to the same process.

7275 Quantitative Method for the Determination of Fiber Texture. B. D. Cullity and August Freda. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 25-30.

A semidirect diffractometer method was developed for the determination of fiber texture in wire or rod. The method is applied to cold-drawn, high-purity Al wire, which has a double fiber texture: 80% of the specimen volume has a [111] texture and 20% a [100] texture.

7276* Fatigue Crack Propagation in Torsion. J. A. H. Hult. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 1, 1957, p. 47-52.

The redistribution of stress and strain in front of a growing crack in an ideally plastic twisted bar is derived for a simple fracture criterion.

7277* The Effect of Impact Loading on the Static Yield Strength of a Medium-Carbon Steel. J. D. Campbell and C. J. Maiden. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 1, 1957, p. 53-62 + 1 plate.

Annealed specimens were subjected to rapidly-applied compressive loads maintained for times of the order of 10^{-4} sec. The applied stresses were between two and three times the static upper yield stress of the steel, and the permanent deformation varied from 1.2% down to very small amounts.

7278* (English.) **Quick Determination of Creep Limit.** Toshio Nishihara, Shuji Taira, Kichinosuke Tanaka, and Masateru Ohnami. *Kyoto University, Engineering Research Institute Technical Report*, v. 7, no. 4, Aug. 1957, p. 65-79.

Tension test data permits estimation of creep limits at various temperatures from the test results obtained at a reference temperature.

7279* (Russian.) Elimination of Hot Tears Using Vibration During Crystallization. **Primenenie vibratsii pri kristallizatsii dlia ustraneniia goriachikh usadochnykh treshchin.** I. I. Novikov, G. A. Korol'kov, and A. E. Semenov. *Liteinoe Proizvodstvo*, 1958, no. 1, Jan., p. 7-8.

Study of the effect of vibration during crystallization on the hot-shortness of alloys. Comparison of macro- and microanalysis of specimens cast with and without vibration. Proportional dependence of the hot-shortness on the frequency of vibration.

7280 Mechanical Springs—Materials, Finishes and Embrittlement. II. Lester F. Spencer. *Metal Finishing*, v. 56, Feb. 1958, p. 66-69.

A discussion of H embrittlement in spring materials.

7281 Research Progress: Mechanism of Creep. *Metal Industry*, v. 92, Jan. 31, 1958, p. 88 + 1 page.

A review of recent research on possible creep mechanisms.

7282* (German.) The Effect of Additions on the Electric Conductivity of Metals. **Die Beeinflussung der elektrischen Leitfähigkeit von Metallen durch Beimengungen.** F. Pawlek and K. Reichel. *Metall*, v. 12, no. 1, Jan. 1958, p. 1-6.

Increase of resistance of Ag, Au, Mg, Al, Pb, Ti, Fe, Ni, Pd, Pt, and Cu. The rule originally set up by Linde for Cu, Ag, and Au is applicable with certain limitations to other basic elements as well.

7283* (German.) Determination of Bending Value of Oxygen-Free Copper Wires of High Electric Conductivity. **Die Biegezahlprüfung an sauerstofffreien Kupferdrähten hoher elektrischer Leitfähigkeit.** H. Klatte. *Metall*, v. 12, no. 2, Feb. 1958, p. 125-126.

Determination of number of 180° bends withstood by wires of various diameters.

7284* (Russian.) The Change of Properties of the Nickel-Chromium Alloy EI 765 Used for Stationary and Transport Turbines During Long (up to 10,000 Hours) Isothermal Heating. **Izmeneniia svoistv nikel'khromovogo splava EI 765 dlia statsionarnykh i transportnykh turbin v protsesse dlitel'nogo (.do 10,000 chas.) izotermicheskogo nagreva.** V. Z. Tseitlin and G. G. Morozova. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 30-35 + 4 plates.

Subjected to 700 to 750 C heating, this alloy showed that its relaxation stability was not changed. To a certain degree, this can also be said about resilience and impact hardness. The physical-chemical processes at this temperature proceed very slowly, and the regeneration of α′-phase to Ni_3Ti was not observed.

7285* (French.) New Research on Refractory Vanadium Steels. **Nouvelles recherches concernant les aciers réfractaires au vanadium.** A. Roos. *Métallurgie et la Construction Mécanique*, v. 90, no. 1, Jan. 1958, p. 9 + 3 pages.

Possibility of substituting V for Mo in certain refractory steels. Creep tests, influence of additions of Mo and V. Refractory properties of the steels.

7286* A Hardness Tester for Small Loads. H. Broschke. *Microtecnic (English Ed.)*, v. 11, no. 5, 1957, p. 231-236.

Construction and use of "Durimet" hardness tester.

7287 An Investigation of Cracked A-212 Catapult Steam Receivers. A. J. Babecki and P. P. Puzak. *Naval Research Laboratory, Report* 5058, Dec. 1957, 12 p. (T21 Un3.5n Contin.)

Study of aircraft-carrier catapult equipment. Fabrication defects and stresses resulting from design particulars were the major causes of base metal cracking in the vicinity of nozzle and manhole reinforcement pads.

7288 The Mechanical and Engineering Properties of Commercially Available Titanium Alloys. H. V. Kinsey. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 100, Apr. 1957, 16 p. (TL565 Ag11r Vis.)

Lists the Ti alloys being produced on a commercial basis up to early 1957. Nominal chemical compositions and manufacturer's designations for these alloys are given.

7289 (English.) **Resistance and Magneto-Resistance of Dilute Alloys of Gold With Iron at Low Temperatures.** A. N. Gerritsen. *Physica*, v. 23, no. 12, Dec. 1957, p. 1087-1099.

7290 Structure in the Thermoelectric Power of Dilute Indium-Lead Alloys. W. J. Tomasch. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 69.

Liquid N and ice temperature measurements of the thermoelectric power of dilute In-Pb alloys indicate that there is detailed structure superimposed on the smooth trend of the data.

7291 Normal and Superconducting Heat Capacities of Lanthanum. A. Berman, M. W. Zemansky, and H. A. Boorse. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 70-76.

Capacities were measured in the range 1.6 to 6.5 K. Two superconducting transitions were found in each sample: one at 4.8 K and the other at 5.9 K.

7292 Superconductivity of Lanthanum and Some Lanthanum Alloys. G. S. Anderson, S. Legvold, and F. H. Spedding. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 243-247.

A close-packed hexagonal structure has a transition temperature near 5.0 K and a face-centered cubic structure has a transition at 5.95 K.

7293 Magnetoresistance Coefficients and Their Temperature Dependence in Iron and Silicon-Steel. Eiji Tatsumoto. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 658-662.

By using single-crystal strips of Fe and Si steel having the crystallographic orientations (001)–[100] and (110)–[111], the magnetoresistance coefficients, and their temperature dependence were measured below room temperature.

7294 Heat Capacity in the Normal and Superconducting States and Critical Field of Niobium. Chien Chou, David White, and H. L. Johnston. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 788-796.

The heat capacity of a vacuum-annealed sample of Nb was determined in the temperature range 1.5 to 30 K. Measurements in the normal state below the transition temperature were carried out in magnetic fields up to 4130 gauss. The effect of vacuum annealing on the heat capacity, transition temperature, and critical field was determined in an effort to obtain a so-called ideal superconductor.

7295* (English.) **Variation of the Hall Coefficient of Mg-Cd Superlattice Alloys With Degree of Order.** Kiyoshi Yonemitsu and Takao Sato. *Physical Society of Japan, Journal*, v. 13, no. 1, Jan. 1958, p. 15-22.

Temperature dependence of the Hall coefficient of Mg_3Cd, MgCd, and $MgCd_3$ was measured to find the effect of order-disorder transformation upon it. At the transformation temperature, the Hall coefficient showed a discontinuous increase in positive direction.

7296 Energy Loss in Transformer Steel. G. M. Leak. *Research*, v. 11, Feb. 1958, p. 56-60.

Effect of impurities on hysteresis loss. Nitrogen showed a much greater effect than C.

7297* (French.) The Relaxation of Special Steels. **Relaxation des aciers spéciaux.** Tummers and W. Soete. *Revue de la Soudure (Brussels)*, v. 13, no. 4, 1957, p. 239-245.

A study of tensile and torsional stresses applied to steel specimens containing 0.5% Mo, or 0.5 Cr-0.62 Mo or 5% Mo. Relaxation as function of time and temperature. Torsion test was found more accurate.

7298* (French.) Note on the Relaxation of Stress Caused by Welding on Ship Plates and Welded Structural Members. **Note sur la relaxation des contraintes de soudage sur les coques de navires et les charpentes soudées.** A. Audige. *Revue de la Soudure (Brussels)*, v. 13, no. 4, 1957, p. 246-253.

A study of the effects of residual stresses on the part of the hull in the water, internal structure, decks, propagation of fractures in welded members and brittle fractures in general. Preventive measures.

7299 (Czech.) Roughness of Surface and Its Effect Upon the Fatigue Limit of Parts Treated by Metal Spraying. **Vliv zdrsnění povrchu před metalisováním na mez únavy součásti.** V. Linhart. *Strojírenství*, v. 7, no. 12, Dec. 1957, p. 917-921.

Causes of surface roughness of parts to be treated by metal spraying and its influence on their fatigue limits. Faulty roughing procedure may cause premature fracture.

7300 (German.) Testing of Steel St52 Containing Additions of Vanadium and Titanium for Large Construction. **Nachprüfung des St 52 mit Vanadin- bzw. Titanzusatz für Grossbauzwecke.** St. Kronmarck. *Technik*, v. 13, no. 1, Jan. 1958, p. 19-28.

Development of steel with a yield strength of 45 kg/mm² or higher.

7301 (German.) Factors Affecting the Strength Properties of Ferromagnetics in the Magnetic Field. **Beeinflussbarkeit der Festigkeitseigenschaften von Ferromagnetika im Magnetfeld.** H. Jahn. *Technik*, v. 13, no. 1, Jan. 1958, p. 29-35.

Carbon steels of different composition and their mechanical properties after electromagnetic and thermal treatment. The lattice of ferromagnetics and their physical properties with respect to the effects of the magnetic field.

7302* (Russian.) Dependence of Thermal Conductivity of Some Heat-Resisting Alloys on Their Condition and Thermal Treatment. **Zavisimost' teploprovodnosti nekotorykh zharoprochnykh splavov ot sostoianiia i termicheskai obrabotki.** R. E. Krzhizhanovskii. *Teploenergetika*, v. 5, no. 1, Jan. 1958, p. 44-48.

Heat and electrical conductivity, and Lorentz's constant for heat resistive steels of the type 18/8 and Ni-base alloys.

7303* (Russian.) Heat and Electrical Conductivities of Chrome-Nickel Austenite Steels. **Teploprovodnost' i elektroprovodnost' khromonikelevykh austenitnykh stalei.** B. E. Neimark. *Teploenergetika*, v. 5, no. 1, Jan. 1958, p. 48-52.

Design of an installation for determination of heat and electrical conductivities of steels with a small temperature difference. Investigations of a series of steels, and the empirical formula for temperature dependence of Lorentz's number for chrome-nickel austenite steels are discussed.

7304 Investigation of the Compressive Strength and Creep Lifetime of 2024-T3 Aluminum-Alloy Plates at Elevated Temperatures. Eldon E. Mathauser and William D. Deveikis. *U. S. National Advisory Committee for Aeronautics, Report* 1308, 1957, 14 p. (TL521 Un3r Vis.)

7305 Creep of Aluminum-Copper Alloys During Age Hardening. E. E. Underwood, L. L. Marsh, and G. K. Manning. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4036, Feb. 1958, 73 p. (TL570 Un3t)

The interrelation of aging during creep and of creep during aging was studied in polycrystalline Al alloys containing 1 to 4% Cu. Aging of 2% Cu alloys under stress resulted in two to three times more precipitation than there was in unstressed samples. The maximum measured amount of precipitation was about ten times greater than that indicated by the phase diagram, assuming the equilibrium precipitate. The compositional dependence of the minimum creep rate at constant temperature revealed a marked increase in creep strength at compositions just inside the two-phase boundary.

7306 Mechanical Properties and Weldability of Six High-Strength Steels Applicable to Pressure Vessels. R. D. Stout and J. H. Gross. *Welding Research Council Bulletin Series, No.* 27, May 1956, p. 1-9. (TS227.Al W45b Vis.)

Six steels were compared on the basis of room- and elevated-temperature tension tests, notch-toughness unwelded and welded, plastic fatigue, and standard weld qualification tests.

7307 Further Studies of the Hot Ductility of High-Temperature Alloys. Ernest F. Nippes, Warren F. Savage, and Gordon Grotke. *Welding Research Council Bulletin Series, No.* 33, Feb. 1957, 32 p. (TS227.A1 W45b Vis.)

The effect of weld thermal cycles on the elevated-temperature properties of 34 different materials is discussed.

7308 The Tensile Properties of Selected Steels as a Function of Temperature. Eugene P. Klier. *Welding Research Council Bulletin Series, No.* 35, Apr. 1957, 9 p. (TS227.A1 W45b Vis.)

Tensile deformation and fracture characteristics of two ship plate steels and one low-alloy steel were determined from 25 to −196 C. The strength coefficient increased regularly with decreasing temperature.

7309 Effect of 475° C Heat Treatment on Cold Worked 18/8 Stainless Steel Wire. Samuel Storchheim. *Wire and Wire Products*, v. 33, Feb. 1958, p. 127 + 2 pages.

An investigation into properties other than corrosion resistance of stainless steel, after it has been heat treated in the carbide precipitation range.

7310 Investigation of Fe-Mn-Cr-N-C System for Heat Resistance and Oxidation Resistance Between 1200 F and 2000 F. Chi-Mei Hsiao and Edward J. Dulis. *Wright Air Development Center, WADC Technical Report* 57-242, Nov. 1957, 144 p. (TL507 Un3.18w Vis.)

Phase boundaries of the base compositions of stable austenitic Cr-Mn-C-N steels were established, and the effects of these elements and of V, W, Mo, and Cb on microstructure, and on room- and elevated-temperature properties were evaluated.

7311* (German.) Conductivity and the Hall Constant. **Leitfähigkeit und Hallkonstante. VI.** Aluminum-Silver Alloys. **Aluminium-Silber-Legierungen. VII.** Deformation and Recrystallization of Pure Metals. **Verformung und Rekristallisation reiner Metalle.** Werner Köster and Wolfgang Schüle. *Zeitschrift für Metallkunde*, v. 48, no. 12, Dec. 1957, p. 628-636.

The resistivity-temperature curve can be extrapolated from the solid solution for thin specimens only. The Hall constant of two-phase alloys can be calculated from those of the constituents. Some anomalies observed in the Hall constant below the solubility line may be explained by local segregation. Resistivity of pure metals increases with deformation, while mobility decreases. Since the relative changes of both are about equal, the perturbation of the lattice periodicity is considered the main reason for the resistivity increase.

7312* (German.) The Properties of Metallic Smelts. **Über die Eigenschaften metallischer Schmelzen. XIV.** The Inner Friction of Molten Pb-Sn and Pb-Sb Alloys. **Die innere Reibung flüssiger Blei-Zinn-und Blei-Antimon-Legierungen.** Erich Gebhardt and Konrad Köstlin. *Zeitschrift für Metallkunde*, v. 48, no. 12, Dec. 1957, p. 636-641.

The internal friction of molten Pb-Sn and Pb-Sb alloys was measured as a function of composition and temperature. The viscosity did not show any anomalies in the eutectic range.

7313* (Russian.) Mass-Spectrometric Determination of Heats of Sublimation of Crystals. **Mass-spektrometricheskoe opredelenie teplot sublimatsii real'nykh kristallov. I.** Zinc. **Tsink.** O. M. Poltorak and G. P. Panasiuk. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2644-2648.

Determination of heats of sublimation of various crystalline Zn specimens from mass-spectroscopic measurements of vapor pressures. The heats of sublimation vary from 15,000 to 30,000 cal/mole, depending on the conditions of preparation of the crystals.

See also: **6790** (superconductivity of Sn); **6791** (superconducting electrical contacts); **6809** (magnetic properties of thin Ni-Fe layers); **7085** (fatigue life of tool steels); **7088** (fatigue of bearings); **7185** (high resistivity AlSb alloy); **7218** (sulfur and tensile properties in sand-cast bronzes); **7370** (electric resistivity of pure Fe); **7375** (internal friction in α iron); **7396** (stress-rupture properties of carbon steel); **7728** (strength of carbon steel welds).

METALS—MECHANICAL WORKING

7314 Blanking and Forming Titanium. W. A. Mays and G. J. Matey. *Aircraft Production*, v. 20, Feb. 1958, p. 52-60.

Comparative formability of various Ti alloys; quality control; techniques and processes, use of heated tools; rubber-die forming; hot-straightening.

7315 Vapour-Blasting of Tools. Increased Tool-Life Obtained in Swedish Tests. *Aircraft Production*, v. 20, Feb. 1958, p. 61-63.

Tests carried out by Svenska Flygmotor Aktiebolaget on the effect of vapor-blasting cutting-tools show increases in tool-life of the order of 2½ times by comparison with tools not so treated. The tools were of CRU Excelsior XXVI steel. For test purposes it was assumed that the tool would be worn out when the wear land reached a width of 0·0055 in. Approximately 20 gas-turbine blades could be machined with vapor-blasted tools compared to about eight for the tools ground in the conventional manner.

7316* (German.) The Hydrodynamic Theory of Hot Rolling. **Zur hydrodynamischen Theorie des Warmwalzens.** Alfred Kneschke. *Archiv für das Eisenhüttenwesen*, v. 29, no. 1, Jan. 1958, p. 11-22.

Theory; pressure distribution; roll pressure; deformation resistance; roller friction torque; rolling stresses.

7317 Experimental and Theoretical Pressures and Velocity Fields for Various Lead Extrusions. E. G. Thomsen and J. Frisch. *ASME, Transactions*, v. 80, Jan. 1958, p. 117-123.

Extrusion ratios were varied from 1.51 to 18.5 (33.7 to 94.6% reduction). For both low and high friction at cylinder wall and at die surfaces, qualitative agreement exists between slip-line solutions and experiment.

7318 Cold Extrusion of Unalloyed Titanium. A. M. Sabroff, O. J. Huber, and P. D. Frost. *ASME, Transactions*, v. 80, Jan. 1958, p. 124-132.

Working with commercially pure grades of Ti having 45,000 and 70,000-psi yield strengths, and employing a fluoride-phosphate coating for Ti, billets 1½-in. diam. were forward extruded to bars 1.16, 1.06, and 0.95-in. diam. These correspond to respective reductions of 40, 50, and 60%. The coating, in combination with a conventional oil-graphite-MoS_2 lubricant, prevented seizing and galling and produced a smooth surface finish.

7319 An Experimental Study on Chatter Vibrations in Grinding Operations. S. Doi. *ASME, Transactions*, v. 80, Jan. 1958, p. 133-140.

Wheel vibration which frequently occurs in practical grinding processes was measured by an optical method, and vibrations were investigated experimentally.

7320 On the Basic Mechanics of the Grinding Process. W. R. Backer and M. E. Merchant. *ASME, Transactions*, v. 80, Jan. 1958, p. 141-148.

New geometrical concepts of grinding are presented and combined with metal-cutting principles to predict grinding forces. The dependence of grinding mechanics on three fundamental variables, the length and cross-sectional area of the undeformed chip, and the cutting speed is shown.

7321 Force Components, Chip Geometry, and Specific Cutting Energy in Orthogonal and Oblique Machining of SAE 1015 Steel. Dimitri Kececioglu. *ASME, Transactions*, v. 80, Jan. 1958, p. 149-157.

7322 Temperature Distribution at Tool-Chip and Tool-Work Interface in Metal Cutting. B. T. Chao and K. J. Trigger. *ASME, Transactions*, v. 80, Feb. 1958, p. 311-320.

A noniterative method is presented for the computation of temperature distribution. Temperatures at the tool-work interface increase appreciably with the increase in flank wear. This phenomenon contrasts to the relatively minor influence on tool-chip interface temperature as crater wear develops.

7323 Transient Interface Temperatures in Plain Peripheral Milling. D. E. McFeron and B. T. Chao. *ASME, Transactions*, v. 80, Feb. 1958, p. 321-329.

7324* Evaluating Ceramic Tools. II. An Analysis of Variables to Determine How Each Affects Cutting Tool Performance. D. R. Kibbey and W. T. Morris. *Automatic Machining*, v. 19, Feb. 1958, p. 42-44.

Illustrates the process of experimental design and analysis using the multi-variable technique. It considers an experiment designed to discover whether cutting speed and/or rake angle have any effect on tool life. Using the multi-variable technique, both the cutting speed and rake angle are varied for each measurement rather than testing either independently of the other.

7325* Carbides Come Through. Raymond C. Spencer. *Automatic Machining*, v. 19, Feb. 1958, p. 55-61.

Bliss & Laughlin, Inc., does high-speed bar turning on the only 4-in. size multiple-tool carbide tool centerless bar turner in operation today. Using either three or four carbide-tipped tools in its high-speed cutter head, surface cutting speeds up to 600 surface ft. per min. give improved control of size, concentricity, and finish; and greatly increased production.

7326* Continuous Production of Taper Bearings. I. Background, Economics, Layout and Auto-Shop. II. Heat Treatment and Transfer Through Furnaces. R. H. Child. *Automation Progress*, v. 3, Feb. 1958, p. 48-52.

(To be continued.)

7327* Numerically Controlled Flame Cutting. *Automation Progress*, v. 3, Feb. 1958, p. 56-57.

Application of numerical control system to a newly developed automatic flame profiling machine. Controls adjust nozzle height and ignition, the whole cycle is automatic.

7328* A Tape-Controlled Flame-Cutting System. *British Communications & Electronics*, v. 5, Feb. 1958, p. 147-148.

7329 Causes of Unsatisfactory Cold Drawability of Iron-Chrome-Aluminum Resistance Alloys. A. P. Boyarinova and S. I. Malov. *Henry Brutcher Translation No.* 4063, 5 p. (From *Stal'*, v. 17, no. 3, 1957, p. 280.) Henry Brutcher, Altadena, Calif.

Study of three heating wire compositions for their contents of nonmetallic inclusions by electrolytic solution and micrographic analysis. Incorporation of nitride-forming elements such as Ti or Zr and their effect on behavior during cold drawing into wire.

7330* (Czech.) The Influence of Principal Metallurgical Factors on Billet Quality and on the Yield in Rolling Seamless Tubes. **Vliv hlavních metalurgických činitelů na jakost sochorů a výtěžek bezešvých trub.** Vilém Friedrich. *Hutnické Listy*, v. 12, no. 12, Dec. 1957, p. 1077-1083.

Analysis of the results obtained in rolling seamless tubes produced partly from rolled billets and partly from round ingots. Characteristics and method of investigation of melts from Bessemer pig iron. Quality, surface conditioning, and nature of defects of billets.

7331* Automatic Gauge Control in Cold Strip Rolling Mill. *Instrument Practice*, v. 12, Jan. 1958, p. 57-61.

Bremsstrahlung radiation from Sr-90 measures thickness. Deviations are automatically corrected.

7332 How to Work Aluminum-Coated Steel. W. E. McFee. *Iron Age*, v. 181, Feb. 6, 1958, p. 95-97.

7333 New Bar Mill. Double Duo Installation Opened at Sanderson's. *Iron & Steel*, v. 31, Feb. 1958, p. 53-55.

Demonstration of a roll arrangement of a double duo mill consisting of two sets of rolls mounted in the same housing, but at different levels and revolving in opposite directions. The maximum length of bars finished in the new mill is 60 ft. and sizes rolled are from ⅜ to 1⅜ in. round, and equivalent bar sections, and flats up to 3 in. wide. Rolling speed is 300/900 ft. per min.

7334 Shot Peening. H. O. Fuchs and E. R. Hutchinson. *Machine Design*, v. 30, Feb. 6, 1958, p. 116-125.

Designer's guide to the process, applications, effects, and how and where to specify it.

7335 The Growing Versatility of Ultrasonic Machining. Jack Welch. *Machinery*, v. 64, Feb. 1958, p. 119-123.

Principles and utilization of ultrasonic machine tools.

7336 Manufacturing in the Aeronautic Age. Boyd K. Bucey. *Machinery Lloyd (Overseas Ed.)*, v. 30, Feb. 1, 1958, p. 71-76.

New aircraft production techniques and equipment include friction sawing, "cookie cutter" dies, large forging presses, numerical control, chemical milling, improved machining and forming methods, new materials, and resistance welding.

7337 Modern Presswork Techniques. T. G. Woodward. *Machinery (London)*, v. 92, Jan. 31, 1958, p. 249-260.

Developments in the use of multi-stage (progressive) tools.

7338* Evaluate All the Factors Involved in Carbide Die Application. *Machine and Tool Blue Book*, v. 53, Mar. 1958, p. 107-115.

For general estimating, a carbide die will cost from 2 to 2½ times as much as a steel die, but a carbide die can usually be depended upon to produce from 8 to 10 times the amount of the steel die's production. There are many instances where carbide dies have outperformed a similar steel die by 25 to 1 and 50 to 1 but these are exceptions rather than the rule.

7339* Computor Controlled Flame Profiling. *Mechanical World and Engineering Record*, v. 138, Feb. 1958, p. 88-90.

The successful addition of a program controller to a flame cutting machine promises high precision in the production of cut plates directly from design data. Machining instructions are embodied in a magnetic tape which can be preserved for use at any time.

7340 Modernization in Heating for Hot Forming. Philip W. Morse. *Metal Progress*, v. 73, Feb. 1958, p. 85-90.

Sixty-cycle three-phase current can economically heat billets for forging, upsetting or extrusion. After the magnetic change point is passed, 960-cycle coils, dual purpose, carry the temperature higher. Several completely automatic systems are described.

7341* Experimental Study on the Combined Influence of the Sharpening Angle of the Tool and of the Cutting Speed on the Modalities of Chip Formation. E. Eugene. *Microtecnic (English Ed.)*, v. 11, no. 5, 1957, p. 223-230.

Systematic cutting tests were made with tools having various sharpening angles at a wide range of cutting speeds to determine the basis for the variation of the optimum angle for the same tool machining different materials or for different tools machining the same material. Electronic flash and spark photographs were taken of the different stages of evolution during the formation of the chip as a function of the cutting speed.

7342* (Russian.) Precision Punching Very Thin Articles. **Jochnaia vyrubka izdelii ves'ma malykh tolshchin.** B. I. Shishkov. *Priborostroenie*, 1957, no. 12, Dec., p. 19-22.

Process for high precision punching of very complicated articles from sheet metal. Method for simultaneous action of dies and punches. Preliminary hardening of steel strip before punching. Multilayer punching of non-ferrous metal sheet under 0.03 mm.

7343 New Extrusion-Fabrication Process Reduces Jet Engine Parts Costs. Neil J. Feola. *SAE Journal*, v. 66, Feb. 1958, p. 32-36.

A process of making ring-shaped Ti jet engine parts by extruding a suitable cross-section in strip form, cutting the strip, bending into a circle, and welding together the ends.

7344* (German.) The Application of the Oxygen Lance Working With Steel Wire or Flux Powder. **Die Anwendung der Kern- und Pulver-Sauerstoff-Lanze.** H. Jansen. *Schweissen und Schneiden*, v. 10, no. 1, Jan. 1958, p. 20-26.

Description of the process. Application of the O lance using steel wire for boring steel and stone and for cutting operations, using flux powder. Investigations into the economy of the processes.

7345 Speed Effects in Deep Drawing. H. T. Coupland and D. V. Wilson. *Sheet Metal Industries*, v. 35, no. 370, Feb. 1958, p. 85 + 19 pages.

A study of the effects of variations in drawing speed on performance in cup drawing using two distinct punch forms. Mild steel and 70/30 brass were tested using mineral oils, colloidal graphite, and an extreme-pressure oil as lubricants.

7346 (German.) The Use of Fuel-Oil in Forging Plants. **Einsatz von Öl tin Schmiedebetrieben.** Karl-Heinz Weber. *Stahl und Eisen*, v. 78, no. 2, Jan. 23, 1958, p. 87-93.

Describes the pusher-roll-over type heating furnace before and after its modification from gas to oil firing.

7347 (German.) The Full-Continuous Medium Strip Rolling Mill of Messrs. Th. Wuppermann GmbH, Leverkusen. **Die vollkontinuierliche Mittelbandstrasse der Firma Th. Wuppermann GmbH, Leverkusen.** Heinrich Lampmann. *Stahl und Eisen*, v. 78, no. 3, Feb. 6, 1958, p. 160-167.

Comparison with American mill designs. Design of furnaces, roughing train, finishing train, and coiling equipment. The drives. Water spray roller table. Regulating, controlling and communication means. Thickness and width gages. Roll bearings. Roll grinding and roll qualities. Water supply system. Descaling equipment.

7348 The Forging Industry, Past and Future. Charles H. Smith, Jr. *Steel Processing and Conversion*, v. 44, Feb. 1958, p. 71-75.

7349 Induction Heating for Hot Forming. Philip W. Morse. *Steel Processing and Conversion*, v. 44, Feb. 1958, p. 95-101.

Factors in modernization of induction methods. Selection of proper frequency. Typical equipment arrangements. Control systems.

7350 (Czech.) Determination of the Optimum Shaping Temperature. **Určení optimálních tvářecích teplot.** V. Hašek. *Strojírenství*, v. 7, no. 12, Dec. 1957, p. 911-914.

New testing method and equipment for determination of upper limits of the shaping temperature, based on twisting the sample in hot condition. Test results for various types of steel.

7351* More Savings From Throwaway Tooling Through Insert Control. Charles Brigner. *Tooling and Production*, v. 23, Feb. 1958, p. 79-81.

Many companies are realizing only a portion of the savings possible with the throwaway tools that are already at work in their plants. One of the chief reasons for these losses is the too-common inaccuracy of inserts. In order to get more mileage from your throwaway tooling dollar make sure that holders are accurate.

7352* Carbide Milling of Steel on Low-Horsepower Machines. Raymond E. Novkov and William B. Stein. *Tooling and Production*, v. 23, Feb. 1958, p. 83-87.

Low-horsepower carbide face milling can now be done on steel with commercially available cutters. Such cutters feature inserted bits, free cutting action, few teeth for the diameter, shock-free cutting, deep carbide support, easy sharpening, and economical carbide inserts.

7353* Recent Progress in Cutting Tool Materials. William E. Montgomery. *Tooling and Production*, v. 23, Feb. 1958, p. 88-92.

The hardness of the carbide particles is for all practical purposes constant under ordinary circumstances and is retained throughout the metal cutting operations. Cobalt binder itself has a melting point of approximately 2700 F, and this temperature must be approached within 600 or 700 F before effective cutting capacity is destroyed. For a given mild steel work material, cutting speeds at which various tool materials will operate efficiently vary from about 100 SFPM for high-speed steel to about 700 SFPM for cermets.

See also: **6729** (digital extensometer for temper rolling mills); **6737** (rolling mill control); **7049** (ultrasonic drill); **7073** (protection of rolling mill neck bearings); **7074** (fog lubrication tools); **7102** (roll-separating force in cold-roll strip); **7263** (grinding of Ti).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

7354 (English.) **Elastic Interaction of Interstitial Atoms in Body-Centered Cubic Crystals.** J. C. Fisher. *Acta Metallurgica*, v. 6, no. 1, Jan. 1958, p. 13-18.

The elastic distortions near interstitial atoms in body-centered cubic crystals are estimated by an atomistic relaxation process.

7355* (German.) Investigation of Metal Structures at High and Low Temperatures. **Untersuchung von Metallgefügen bei hohen und niedrigen Temperaturen.** Přemysl Ryš, Ladislav Bezděk, Karel Číha, Dalibor Růžička, and Jiří Škarek. *Acta Technica*, v. 3, no. 1, 1958, p. 58-83 + 2 plates.

The conception and significance of high and low temperature microscopy. Structure investigations of carbon and alloyed steels, cast iron, non-ferrous metals, and alloys by means of a high temperature microscope and cooling chamber.

7356* (German.) The Effect of Regranulation on the Grain Size and the Structural Composition of Ferrite and Austenite in an Unalloyed Steel With 0.15% C. **Einfluss der Umkörnung auf Korngrösse und Gefügeausbildung von Ferrit und Austenit in einem unlegierten Stahl mit 0.15% C.** Heinz Borchers and Günther Boxhorn. *Archiv für das Eisenhüttenwesen*, v. 29, no. 1, Jan. 1958, p. 47-56.

Structural change during heating within the range of Ac_1 and Ac_3. Comparison of ferrite and austenite structures following repeated hot etchings above Ac_1 and Ac_3.

7357* (German.) A Contribution to the Iron(II) Oxide-Iron(II) Sulfide-Manganese(II) Oxide-Manganese(II) Sulfide System. **Ein Beitrag zum System Eisen(II) oxyd-Eisen(II)-sulfid-Mangan(II)-oxyd-Mangan(II)-sulfid.** Klaus Geissler and

Ernst J. Kohlmeyer. *Archiv für das Eisenhüttenwesen*, v. 29, no. 1, Jan. 1958, p. 57-63.

Determination of equilibrium conditions within this quaternary system, and the related binary and ternary systems, by melting in alumina crucibles followed by thermomagnetic and microscopic tests.

7358* (Polish.) Electrochemical Index of the Degree of Micro-Segregation in Technical and Pure Aluminum. **Elektrochemiczny wskaźnik stopnia mikrosegregacji w aluminium technicznym i czystym.** Antoni Piotrowski. *Archiwum Hutnictwa*, v. 2, no. 4, 1957, p. 377-390 + 1 plate.

Micro-segregation in technical Al of (0.19% Fe, 0.20% Si, and 0.004% Cu) and in high purity Al (99.99% Al) is reported.

7359 Defect Production and Migration in Copper and Nickel. A. Sosin and C. J. Meechan. *Atomics International, North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-2062, Nov. 1957, 21 p. (UF767 Un3.1na Contin.)

The recovery of electrical resistivity change of high purity Cu, Ni, and Au was studied from 4.2 to 870 K following electron irradiation and cold-work.

7360 The Effect of Primary Alpha on the Beta Decomposition of Zirconium-Uranium-Oxygen Alloys. David L. Douglass and Lyle L. Marsh, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1249, Jan. 1958, 15 p. (UF767 U3b Contin.)

The effect of primary α present during the solution-treating cycle on the incubation period for the decomposition of β and on the resultant structure was determined. Prior-existing α decreased the time at which precipitation of Widmanstätten α started and increased the rate of precipitation. The micro-structure of transformed alloys was correlated with tentative isothermal-transformation diagrams.

7361 A Technique for Obtaining Thin Foils of Aluminium and Aluminium Alloys for Transmission Electron Metallography. R. B. Nicholson, G. Thomas, and J. Nutting. *British Journal of Applied Physics*, v. 9, Jan. 1958, p. 25-27.

Foils of Al-Cu and Al-Mg-Zn-Cu alloys were obtained by mechanical reduction in thickness followed by controlled electropolishing and chemical dissolution of the remaining oxide film.

7362 Study of Bond Forces in Solid Solutions of Iron and Molybdenum From the Fine Structure of X-Ray Absorption Spectra. V. A. Trapeznikov and S. A. Nemnonov. *Henry Brutcher Translation No.* 4009, 12 p. (From *Fizika Metallov i Metallovedenie*, v. 3, no. 2, 1956, p. 314-320.) Henry Brutcher Altadena, Calif.

7363 Solidification of Hypereutectic Magnesium-Treated Cast Iron. A. V. Chernovol. *Henry Brutcher Translation No.* 4044, 5 p. (From *Metallovedenie i Obrabotka Metallov*, 1957, no. 10, Oct., p. 21-22.) Henry Brutcher, Altadena, Calif.

Proposes that nodular graphite is formed in hypereutectic Mg-inoculated iron directly from solution, and not through decomposition of precipitated cementite. The graphite inclusions acquire a compact, equiaxed shape at very early stages of their growth in direct contact with liquid and retain it to complete solidification of the iron.

7364 Prevention of Λ Segregation in the Solidification of Steel by Treatment With Rare-Earth Elements. V. M. Tageev and Iu. D. Smirnov. *Henry Brutcher Translation No.* 4060, 14 p. (From *Stal'*, v. 17, no. 9, 1957, p. 823-828.) Henry Brutcher, Altadena, Calif.

Study of effect of additions of Ce and La to deoxidized liquid steel on the segregation of S and P, and the grain size of steel ingots, based mainly on autoradiography.

7365* (French.) Phenomenon of Regeneration of a Unique α-Iron Crystal by the Preservation of Nuclei During the Allotropic α⇌γ Transformation. **Mise en évidence d'un phénomène de régénération d'un cristal unique de fer α par conservation de germes au cours de la transformation allotropique α⇌γ.** Gérard Donzé and René Faivre. *Comptes Rendus*, v. 245, no. 25, Dec. 16, 1957, p. 2277-2280.

The presence of α-iron in the γ-iron polycrystalline structure explains the property of regeneration during cooling, possessed by an α-iron crystal containing impurities such as C or N, when heated slightly beyond its transformation point.

7366* (French.) Constitution Diagrams of Binary Alloys Based on Cases of Intermetallic Diffusion. Application to the Uranium-Zirconium System. **Établissement des diagrammes d'équilibre des alliages binaires par des expériences de diffusion intermétallique. Application au système uranium-zirconium.** Jean Philibert and Yves Adda. *Comptes Rendus*, v. 245, no. 26, Dec. 23, 1957, p. 2507-2510.

The concentration - penetration curves relative to diffusion couples of two metals A and B offer concentration discontinuities corresponding to the isothermal interactions of the solubility curves of the equilibrium diagram. Zirconium-rich alloys are always polluted by O.

7367* (French.) Growth of Perfect Large α-Uranium Crystals by Means of the Cold-Working and Annealing of Recrystallized Single Crystals Obtained by Phase Change. **Croissance de gros cristaux parfaits d'uranium α par écrouissage et recuit de monocristaux polygonisés obtenus par changement de phase.** Jean Mercier, Daniel Calais, and Paul Lacombe. *Comptes Rendus*, v. 246, no. 1, Jan. 6, 1958, p. 110-113.

Tension cold-working of imperfect α-U crystals obtained by phase change from β to α resulted in perfect large crystals by recrystallization. A comparison of the tension curves of polycrystals and single crystals explained the failure of critical cold working method when applied to polycrystals.

7368* (French.) Study of the Kirkendall Effect and Determination of the Chemical and Intrinsic Diffusion Coefficients in the U-Mo Pair. **Étude de l'effet Kirkendall et détermination des coefficients de diffusion chimiques et intrinsèques dans le couple U-Mo.** Yves Adda and Jean Philibert. *Comptes Rendus*, v. 246, no. 1, Jan. 6, 1958, p. 113-116.

The Kirkendall effect was clearly determined in the cubic-centered phase of U-Mo. Calculation of the chemical diffusion coefficients from 800 to 1050 C. Variation with concentration. Quantitative study of the Kirkendall phenomenon.

7369* (French.) Discontinuous Recrystallization of Aluminum-Copper Alloys. **Sur la recristallisation discontinue des alliages aluminium-cuivre.** Christiane Renon and Jean Calvet. *Comptes Rendus*, v. 246, no. 2, Jan. 13, 1958, p. 269-272.

Some heterogeneous textures were explained by a discontinuous growth of the grains obtained after sufficient rolling and hardening.

7370* (French.) Studying Aging of Pure Iron by Measuring Resistivity at Very Low Temperatures. **Étude du vieillissement du fer pur, par mesure de résistivité aux très basses températures.** Bernard Migaud and Michel Wintenberger. *Comptes Rendus*, v. 246, no. 3, Jan. 20, 1958, p. 425-428.

Electric resistivity was definitely influenced by the presence of C dissolved in α-iron. Precipitation of carbides from supersaturated solid solution.

7371* (French.) Contribution to the Study of the Iron-Carbon Constitution Diagram. Solubility of Carbon in Pure Iron. **Contribution à l'étude du diagramme d'équilibre fer-carbone. Solubilité du carbone dans le fer pur.** Paul Gendrel and Léon Jacqué. *Comptes Rendus*, v. 246, no. 4, Jan. 27, 1958, p. 596-599.

Maximum solubility limits of C in γ-iron were determined for Fe samples of different degrees of purity, by measuring the speed of reaction. A decrease of solubility was found when the initial degree of purity of the metal increases.

7372* (Russian.) Diffusion in Solid Solutions of Variable Concentration. **O diffusii v tverdykh rastvorakh s peremennoi kontsentratsiei.** L. S. Palatnik and A. P. Liubchenko. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 407-410.

An equation is suggested for a system under stress and temperature gradients.

7373* (Czech.) The Influence of Silicon and Chromium on the Eutectoid Transformation of Austenite During Continuous Cooling of Spheroidal Cast Iron. **Vliv křemíku a chromu na eutektoidní přeměnu austenitu při plynulém ochlazování tvárné litiny.** Stanislav Drápal. *Hutnické Listy*, v. 12, no. 12, Dec. 1957, p. 1087-1094.

Microstructure of products of austenite transformation.

7374 Micro-Constituents in Steels. Their Electrolytic Isolation and X-Ray Study. K. W. Andrews and H. Hughes. *Iron & Steel*, v. 31, Feb. 1958, p. 43-50.

Methods for separating the micro-constituents in steels so that they can be satisfactorily examined by X-rays or other methods.

There are three well-defined stages: isolation of the particles by electrolytic methods; examination, in particular by X-ray analysis in order to identify them and to provide information on particle size or shape, solid solution effects (lattice parameter) etc.; and the use of these results in explaining or interpreting properties and behavior of steels.

7375 Internal Friction. Application to Study of Diffusion and Precipitation. P. M. Robinson and R. Rawlings. *Iron & Steel*, v. 31, Feb. 1958, p. 65-68.

Internal friction measurements can be used to determine the solubility of C and N in α-iron at various temperatures and to follow precipitation from solid solution.

7376 The Metallography of Low-Carbon Bainitic Steels. K. J. Irvine and F. B. Pickering. *Iron and Steel Institute, Journal*, v. 188, Feb. 1958, p. 101-112.

A relationship between tensile strength and the structural features was derived.

7377* (Russian.) Solubility of Iron in Molten Tin. **O rastvorimosti zheleza v rasplavlennom olove.** I. A. Kakovskii and N. S. Smirnov. *Izvestiia Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, 1957, no. 11, Nov., p. 44-51.

Metalloid $FeSn_2$ at 250 to 480 C was studied. A formula is suggested for the solubility in the range from 235 to 485 C.

7378 X-Ray Study of Faults in Body-Centered Cubic Metals. O. J. Guentert and B. E. Warren. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 40-48.

Theoretical study of the influence of deformation and twin faults on the X-ray diffraction pattern of a b.c.c. lattice. Measurements on cold-worked β-brass.

7379 The Rate of Reaction of Nitrogen With Hafnium Metal. Russell K. Edwards and Glenn T. Malloy. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 45-47.

The reaction rate was studied in the temperature range 876-1034 C and over the pressure range 38-402 mm. The rate of reaction behavior follows the simple parabolic rate law without deviation for up to 135 min.

7380* (Russian.) On Magnesium Distribution in High-Strength Cast Iron. **O nekotorykh osobennostiakh raspredeleniia magniia v vysokoprochnom chugune.** I. L. Mirkin and E. P. Rikman. *Liteinoe Proizvodstvo*, 1957, no. 12, Dec., p. 13-16.

Investigation of Mg cast iron by means of improved method of microspectral analysis with "point" spark of rectified H.F. current.

7381* (Russian.) Structural Anomalies in Gray Iron. **Strukturnye anomalii v serom chugune.** A. A. Zhukov. *Liteinoe Proizvodstvo*, 1957, no. 12, Dec., p. 16-20.

Shows that the relatively frequent structural anomalies in gray iron, such as "rarefied" pearlite, and so-called "primary" ferrite is a result of reverse liquation of Si which is a regular phenomenon and plays an important part in the structure formation of cast iron.

7382 S-Curves and Their Use in the Heat-Treatment of Steel. J. Lomas. *Machinery Lloyd (Overseas Ed.)*, v. 30, Feb. 1, 1958, p. 88-90.

Behavior of steel subjected to heat-treatment producing transformation of austenite depends largely on factors affecting transformation time and temperature. These factors are revealed by the form and location of isothermal transformation diagrams or S-curves.

7383* (German.) The Effect of Disilicides (Ti, Zr, Mo, W) on the Recrystallization of Pure Aluminum, and on the Formation of Inclusions. **Der Einfluss von Disiliziden (Ti, Zr, Mo, W) auf die Rekristallisation und Zipfelbildung von Reinaluminium.** H. Huschka and H. Nowotny. *Metall*, v. 12, no. 1, Jan. 1958, p. 6-12.

7384* (Russian.) Effect of Ultrasound on the Formation of Eutectic Alloy Structure. **Vliianie ul'trazvukovykh kolebanii na formirovanie struktury evtekticheskikh splavov.** V. V. Zaboleev-Zotov and G. I. Pogodin-Alekseev. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 2-6.

Effect of ultrasonic vibrations on solidification of Pb-Sb, Zn-Sn, Al-Si, and Al-Sn alloys.

7385* (Russian.) X-Ray Investigation of the Double V-W Carbides. **Rentgenograficheskoe issledovanie dvoinykh vanadii-vol'framovykh karbidov.** M. A. Gurevich and B. F. Ormont. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 7-10.

X-ray studies were made on samples having compositions ranging from approximately 98 mol.% VC plus 2 mol.% WC to 48 mol.% VC plus 52 mol.% WC. Up to 10 mol.% of hexagonal WC dissolves in the cubic VC at 1700 to 1800 C. At 2150 to 2200 C a single phase is formed, i.e., a continuous line of solid solutions with a gradually changed lattice constant from $a=4.16$ to 4.21kX. In this temperature range about 50 mol.% of WC dissolves in VC.

7386* (Russian.) Structural Diagram of the System Chromium - Niobium. **O diagramme sostoianiia sistemy khrom-niobii.** V. N. Eremenko, G. V. Zudilova, and L. A. Gaevskaia. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 11-16.

Shows that the Cr-Nb system forms only one intermetallic compound, $NbCr_2$; it has a face-centered cubic lattice. The solubility of Nb in Cr at 1350 C is about 3 wt.%.

7387* (Russian.) The Effect of Boron on the Kinetics of Austenite Grain Growth and on the Size of the Actual Grain. **Vliianie bora na kinetiku rosta zerna austenita i velichinu deistvitel'nogo zerna.** A. M. Tarasov. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 17-20.

The optimal quantity of B that does not stimulate the growth of grains of chrome-manganese steel under the usual conditions of chemico-thermal treatment is 0.0015 to 0.003%. The amount of 0.005% of B in reinforcing steel is undesirable, and 0.006% causes growth of grains under industrial conditions of treatment.

7388* (Russian.) The Nature of the Interaction of Titanium Boride With Metals of the Iron Group. **Kharakter vzaimodeistviia borida titana s metallami gruppy zheleza.** G. V. Samsonov. *Metallovedenie i Obrabotka Metallov*, 1958, no. 1, Jan., p. 35-38.

Diagrams of the pseudobinary systems TiB_2-(Fe, Co, Ni), and TiC-(Fe, Co, Ni) have eutectic character. In the case of TiB_2 the eutectic temperature is 100 to 200 C lower, and it changes from Fe to Ni with the same sequence as in the systems with TiC. The solubility of TiB_2 in Fe, Co, and Ni at eutectic temperatures is 2 to 3 times lower than that of TiC.

7389* (Russian.) The Growth of Grains and Decarburization of Surface Layers During the Induction Heating of Steel Bars. **Rost zerna i obezuglerozhivanie poverkhnostnykh sloev pri induktsionnom nagreve stal'nykh zagotovok.** Ia. I. Karker and M. G. Kogan. *Metallovedenie i Obrabotka Metalloc*, 1958, no. 1, Jan., p. 46-49.

Induction heating at 1100 to 1200 C for 2-3 min. does not cause decarburizing and growth of grains. 1200 C for up to 5.5 min. is accompanied with decarburizing up to 0.15 mm. At 1300 C structural signs of overheating occur.

7390 (German.) Studies of the Systems V-B, Nb-B, V-B-Si, and Ta-B-Si. **Untersuchungen in den Systemen: V-B, Nb-B, V-B-Si, and Ta-B-Si.** H. Kudielka, H. Nowotny, and G. Findeisen. *Monatshefte für Chemie*, v. 88, no. 6, 1957, p. 1048-1055.

Vanadium and Nb borides were studied by means of X-ray measurements. A new phase, with the approximate composition V_2B was identified. This phase is similar to the corresponding Nb boride phase. A similar type of crystal shows up in the system Ta-B.

7391 Investigation of Beta Phase "Recrystallization" in Ti-3% Al-5% Cr Alloy. K. B. Lloyd and E. J. Chapin. *Naval Research Laboratory, Report* 5034, Nov. 1957, 19 p. (T2l Un3.5n Contin.)

The binary Ti-Al alloy compositions studied did not form networks of small "recrystallized" β grains when heat treated just below their transus, but Cr appeared to promote the formation of the small β grains at temperatures just below the transus in both the binary and ternary series with Cr.

7392* (German.) Physical Properties of Hard Metals as Related to Carbon Content. **Physikalische Eigenschaften der Hartmetalle in Abhängigkeit vom Kohlenstoffgehalt.** R. Bernard. *Neue Hütte*, v. 2, no. 12, Dec. 1957, p. 757-761.

Normally, hard-metal alloys consist of a WC phase, a solid-solution phase based on TiC, and a Co phase. These components never have a stoichiometric composition. If C is too low, the double carbide Co_3W_3C forms. Other structures have also been identified, such as $Co_3W_6C_2$ and $Co_3W_{10}C_4$. The range of carbon content yielding satisfactory combinations is narrowly limited. It usually amounts to 2% for a WC-Co alloy with 10% Co.

7393 X-Ray Study of Deuteron-Irradiated Copper Near 10°K. R. O. Simmons and R. W. Balluffi. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 335-344.

Precise measurements of lattice expansion of high-purity Cu held near 10 K during deuteron bombardment were made using a rotating single-crystal method.

7394 (German.) Effect of Austenitizing Conditions on the Structure and Behavior During Transformation of Plain Carbon Steel. **Die Wirkung der Austenitisierungsbedingungen auf Gefüge and Umwandlungsverhalten von unlegierten Stählen.** Heinz Borchers and Günter Saur. *Stahl und Eisen*, v. 78, no. 1, Jan. 9, 1958, p. 40-46.

Effect of annealing temperature and time on size of the ferrite and austenite grain and lattice, and their relations to each other. Relationships between annealing time and temperature in austenitizing, cooling rate, C content, grain size, structure, and undercooling of the transformation.

7395 Looking Inside Stainless Ingots. J. C. Fulton and R. H. Henke. *Steel*, v. 142, Feb. 17, 1958, p. 132 + 1 page.

The as-cast structure of some ferritic and austenitic stainless alloys was examined.

7396 Graphitization of Steel in Petroleum Refining Equipment and the Effect of Graphitization of Steel on Stress-Rupture Properties. *Welding Research Council Bulletin Series, No.* 32, Jan. 1957, 44 p. (TS227.A1 W45b Vis.)

Presents the results of tests conducted on 554 specimens of C and C-Mo steel removed from petroleum refining equipment. Graphite formations were found in 33.8% of these specimens.

7397 Hydrogen Redistribution in Thin Plates of Zirconium Under Large Thermal Gradients. J. M. Markowitz. *Westinghouse Electric Corporation, Bettis Plant, (U. S. Atomic Energy Commission)*, WAPD-TM-104, Jan. 1958, 33 p. (UF767 Un3.1wa Contin.)

The basic quantity determining this redistribution, the heat of transport, amounts to 4.2 to 7.1 kcal/mole, depending on the particular data used.

7398 Phase Relationships in Magnesium Alloys. J. J. Park and L. L. Wyman. *Wright Air Development Center, WADC Technical Report* 57-504, Oct. 1957, 27 p. (TL507 Un3.18w Vis.)

A study of phase relationships using thermal, X-ray, and metallographic methods. The magnesium-rich portions of the binary phase diagrams of Mg plus certain rare earth metals (La, Ce, Pr, and Nd) were determined and the Mg-Zn system was studied.

7399* (English.) **A Note on the Energy of Activation of Self-Diffusion in Some Metals.** Ram Gopal. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 293, nos. 1-2, Dec. 1957, p. 53-55.

Similarity between the energy of activation of self-diffusion in some metals and their respective latent heat of sublimation, estimated for the case when the metallic binding is absent is discussed.

7400* (German.) Diffusion in Ag-Al Alloys. **Über die Diffusion in Ag-Al-Legierungen.** Th. Heumann and S. Dittrich. *Zeitschrift für Elektrochemie*, v. 61, no. 9, 1957, p. 1138-1146.

Measuring diffusion coefficients and activation energies for the total concentration range of the Al-rich area of the phase diagram. Mobility of the Ag and Al atoms decreases with increasing Ag concentration due to an increase of the activation energy.

7401* (German.) The Size of Particles and the Lattice Distortion of Tungsten Powder and Tungsten Carbide Powder. **Teilchengrösse und Gitterverzerrung von Wolfram- und Wolframkarbidpulvern.** Hans Hendus, Walther Dawihl, and Gunnar Bartsch. *Zeitschrift für Metallkunde*, v. 48, no. 12, Dec. 1957, p. 615-624.

Tungsten powder, as produced by reduction from paratungstate and from tungstic acid, results in WC specimens of different grain sizes and hardness numbers. These powders and the corresponding carbides were investigated by X-rays and electron microscopy. The influence of reduction temperature and other parameters is discussed.

7402* (German.) The Diffusion of Oxygen in Tantalum. **Über die Diffusion von Sauerstoff in Tantal.** Erich Gebhardt, Hans-Dieter Seghezzi, and Arnold Stegherr. *Zeitschrift für Metallkunde*, v. 48, no. 12, Dec. 1957, p. 624-627.

The diffusion of O in Ta was investigated between 700 and 1400 C with a band shaped specimen loaded with gas at one end. The diffusion coefficient obtained depends on temperature, following Arrhenius equation. The interstitial diffusion takes place with an activation energy of 26.7 kcal/mole.

7403* (German.) The Oriented Growth of Tungsten Carbide on Copper Single Crystal Spheres. **Das orientierte Aufwachsen von Wolframkarbid auf Kupfer-Einkristall-Kugeln.** Chr. Menzel-Kopp. *Zeitschrift für Naturforschung*, v. 12a, no. 12, Dec. 1957, p. 1003-1006 + 1 plate.

Appearance and structure of $W_2C(Mo_2C)$ on pure Cu single crystal surfaces. Electron diffraction studies. Comparison of intergrowths with the very similar orientation of cubic Cu_2O on Cu.

See also: **6417** (X-ray powder patterns of the Ti-O system); **6671** (Zr-Ni and H); **6794** (metallographic electrolytic polishing); **6809** (structure of Ni-Fe layers); **7120** (structure of binary liquid alloys); **7270** (high temperature and loading on heat-resisting steels); **7284** (structure of Ni-Cr-Ti alloy); **7290** (structure of In-Pb alloys); **7310** (microstructure of Cr-Mn-C-N steels); **7412** (ultrasonics and steel structure); **7721** (structure of chromansil steel); **7722** (electrolytic development of weld structures); **7738** (brazing alloy, base metal interface reactions).

METALS—POWDER

7404 Reduction Structures of Iron Powder. J. O. Edström. *Henry Brutcher Translation No.* 3886, 10 p. (From *Jernkontorets Annaler*, v. 140, no. 2, 1956, p. 116-129.) Henry Brutcher, Altadena, Calif.

Effect of reduction temperature and composition of reducing gas and ore upon density, porosity, and C content of Fe powder. Reduction structures of Fe powders obtained from magnetite and hematite under different conditions.

7405* Grain Formation in Hard Metal Alloys. Walther Dawihl. *Microtecnic (English Ed.)*, v. 11, no. 5, 1957, p. 237-244.

The effect of grinding time on the characteristics of ground particles and on the sintered grain size was studied. Powders were ground in acetone with hard metal balls in a stainless steel mill. Particle sizes were determined by the X-ray method. Wet grinding produces considerable distortion of the Co lattice, which is probably caused by crushing the grains to sizes far below 0.1 μ; after wet grinding of WC and WC with a 5% addition of Co, no noticeable change in the X-ray spectrogram takes place, nor does any noticeable crushing of WC occur.

7406* (German.) The State of Development of High Temperature Carbide Materials in the German Democratic Republic. **Stand der Entwicklung hochwarmfester Karbidwerkstoffe in der Deutschen Demokratischen Republik.** Fritz Thümmler and Gotthard Blum. *Neue Hütte*, v. 2, no. 12, Dec. 1957, p. 762-763.

Density, hardness, bending-tensile strength (cold and hot), and the resistance to sudden change in temperature and oxidation, are listed for the following systems: TiC-TaC-Co-Ni-Cr; TiC-Tac-Co-Ni; TiC-TaC-Ni; TiC-Cr_3C_2-Ni.

7407 (German.) Some Problems in the Theory and Practice of Powder Metallurgy in the Soviet Union. **Einige Fragen aus Theorie und Praxis der sowjetischen Pulvermetallurgie.** W. S. Rakowski. *Neue Hütte*, v. 2, no. 12, Dec. 1957, p. 764-767.

Describes Russian work on investigations of the sintering process with the aid of "marked" atoms; influence exerted on the sintering process by sonic oscillations; cermet friction materials; and large-sized porous railway plain bearings made of iron powder.

7408 (German.) Manufacture and Properties of Stainless Sintered Steel. **Herstellung und Eigenschaften von korrosionsbeständigem Sinterstahl.** Friedrich Eisenkolb. *Stahl und Eisen*, v. 78, no. 3, Feb. 6, 1958, p. 141-148.

Manufacture of powders from steels containing about 18% Cr and 8% Ni by means of intergranular disintegration, atomization, and jet atomization processes. Grain size grading, grain shape, and pressing and sintering characteristics of these powders. Effects of compacting pressure, sintering temperature, application of the double pressing process, sintering time, furnace gases, and addition of 0.1 to 0.3% of boron, 1.0 to 1.5% of red phosphorus, and 0.1 to 0.6% of phosphorus from ferro-phosphorus, on the specific weight, tensile strength, and breaking elongation of austenitic sintered steels.

7409 (German.) Effect of Boron on the Formation of Liquid Phases in Sintered Steel (Steel With 18% Cr and 8% Ni). **Einfluss von Bor auf die Bildung flüssiger Phasen in Sinterstahl, besonders in Stählen mit rd. 18% Cr und 8% Ni.** Friedrich Benesovsky and Werner Hotop. *Stahl und Eisen*, v. 78, no. 3, Feb. 6, 1958, p. 149-152.

Density, hardness, tensile strength, elongation, impact strength and structure of various samples sintered 1 hr. at 1100 C or 2 hrs. at 1250 C. Effect of Ni-Cr-B additions on resistance to scaling.

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

7410 Ultrasonics, the Key to Locating Defects in Metal Structure. Robert N. Hafemeister. *Allis-Chalmers Electrical Review*, v. 22, no. 4, 1957, p. 20-24.

Equipment, techniques, and applications.

7411 Development of Ultrasonic Techniques for Inspecting Experimental Boiling Water Reactor Cast Uranium Alloy Cores and Fuel Plates. W. N. Beck and W. J. McGonnagle. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5653, Dec. 1957, 31 p. (UF767 Un3.1an Contin.)

A special scanner was designed and fabricated. The equipment could serve as a research tool as well as being used for inspecting numerous items of diversified lengths and shapes. A transmission technique was used at an ultrasonic frequency of five Mc. It was possible to detect piping, shrink, porosity, inclusions, and microinclusions in the U alloy castings. In the completed fuel plates, a non-bond area of ¾ of an in. in diameter could be located.

7412 Use of Ultrasound for Study of the Structure of Steels. L. G. Merkulov. *Henry Brutcher Translation No.* 4057, 6 p. (From *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, 1957, p. 1387-1391.) Henry Brutcher, Altadena, Calif.

Advantages of a nondestructive method for testing large steel components for completeness of through-hardening; determination of mean grain size; testing forgings for quality.

7413 Ultrasonic Gage Speeds Field Work. Henry N. Nerwin. *Electronics*, v. 31, Jan. 31, 1958, p. 29-31.

Sweep-frequency sensing system and direct-reading indicator assembly measure thickness ultrasonically by determining frequency of standing wave generated within material.

7414 Plating Thickness Tester. C. E. Fitch, Jr. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-53632, Nov. 1957, 19 p. (UF767 Un3.1hw Contin.)

Electromagnetic eddy current instrument is capable of measuring Cu and Ni plating 1 to 8 mils thick, plated on Bi mandrils of various sizes and shapes.

7415 X-Ray Tin Thickness Gage. R. R. Webster. *Instruments and Automation*, v. 31, Feb. 1958, p. 276-277.

This non-contacting gage measures X-ray fluorescence of iron to give a continuous record of tin coating weight to a precision of ±0.01 lb. of tin per base box.

7416 Assessment of Surface Finish. A New Interference Microscope. *Iron & Steel*, v. 31, Feb. 1958, p. 63-64.

7417 Thickness of Lead Deposits. Measurement by Means of Beta Rays. Gunner Gabrielson and Kurt Ljunggren. *Metal Finishing*, v. 56, Feb. 1958, p. 52-53.

7418* The Fundamentals of Differential Radiation Measurements. Richard A. Nickerson. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 24 + 4 pages.

Mathematical treatment of absorption processes and clarification of the factors which affect ability to discriminate between small differences in the amount of radiation which interacts with the work.

7419* Using Water as a Liquid Vehicle in the Wet Continuous Method of Magnetic Particle Inspection. Vernon Wiegand and E. H. Honerkamp. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 28-30.

Chief difficulties in the use of oil soluble magnetic paste, advantages of water soluble magnetic particle solutions, and properties of suitable additive. Magnetic particle inspection equipment, testing procedure, and results.

7420* The Measurement of Wall Thickness of Metal From One Side Only, by the Direct Current Conduction Method. J. G. Buchanan, F. W. Marsh, and R. C. A. Thurston. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 31-35.

Method involves measurement of the resistance of an area, roughly circular, by means of a 4-electrode array; an increase in resistance indicates a decrease in thickness, and vice versa. Practical application of the method and equipment for measuring corrosion thinning in steel plates, defects in plates, wall thinning of tubes, and lack of bonding.

7421* Frequency Selection for Eddy Current Testing. B. H. Robinson. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 36-39.

An attempt to explain why in certain eddy current instruments a wide frequency range of more than a million to one is needed, and what frequency is best for a particular application. Selection of frequency for the testing of nonmagnetic rods, tubes, and wires for longitudinal cracks by means of annular coils.

7422* Modern High Speed Radiographic Technics Speed and Simplify Douglas Inspection. E. W. Makin. *Nondestructive Testing*, v. 16, Jan.-Feb. 1958, p. 42-43.

A comparatively quick and inexpensive inspection method for control surfaces and inaccessible structural segments of airframes.

7423 Film Thickness Determination From Substrate X-Ray Reflections. D. T. Keating and O. F. Kammerer. *Review of Scientific Instruments*, v. 29, Jan. 1958, p. 34-36.

X-rays pass through the film and are diffracted by the substrate back to the counter, the intensity being reduced by absorption due to double transmission through the film.

See also: **6737** (thickness gage); **6875** (X-ray image intensifier); **7068** (inspection of steel ball bearings).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

7424* (German.) A New Nuclear-Physics Emulsion, "Forte P/22". (Preparation and Properties). **Eine neue kernphysikalische Emulsion Forte P/22 (Herstellung und Eigenschaften).** L. Medveczky and A. Polster. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 211-230.

Factors required for the preparation of nuclear emulsions are analyzed; a new nuclear emulsion with electron sensitivity reaching 30 k.e.v. was prepared.

7425* (English.) **Estimation of the Height of the Potential Barrier of Hindered Rotation in the CH_3SH Molecule by Means of Thermal Neutron Scattering.** A. Budzanowski, et al. *Acta Physica Polonica*, v. 16, no. 5, 1957, p. 335-342.

The cross section of CH_3SH molecules measured by thermal neutron scattering was $\sigma = (194.5 \pm 5)$ barns, determined by the method of relative attenuation of the beam. The cross section for rigid CH_3SH molecules calculated on the basis of the theory of Sachs and Teller was $\sigma_{rig} = 258$ barns.

7426 Determination of Burnout Limits of Polyphenyl Coolants. T. C. Core and K. Sato. *Aerojet-General Corporation (U. S. Atomic Energy Commission)*, IDO-28007, Feb. 1958, 89 p. (UF767 Un3.1id Contin.)

Experimental determinations of the burnout flux for polyphenyl coolants, as a function of coolant velocity and subcooling, were conducted on a polyphenyl mixture, diphenyl, Santowax R, and monoisopropylbiphenyl.

7427 Selecting Nuclear Pumps and Motors. A. F. Erwin. *Allis-Chalmers Electrical Review*, v. 22, no. 3, 1957, p. 4-9.

Special factors influencing pump selection.

7428* (German.) Lithium in the Field of Nuclear Engineering. **Lithium in der Kerntechnik.** A. Klemm. *Angewandte Chemie*, v. 70, no. 1, Jan. 7, 1958, p. 21-24.

Used in modern nuclear engineering for thermonuclear reactions or, in the form of molten LiF, as a solvent for nuclear fuels.

7429* (German.) Electrical Analogue Switching for the Heat Exchange Processes in a Nuclear Reactor. **Eine elektrische Analogieschaltung für die Wärmeaustauschvorgänge im Kernreaktor.** G. Kourim. *Archiv für Technisches Messen*, 1957, no. 263, Dec., p. R141-R144.

Comparatively simple method for simulating heat exchange phenomena in a nuclear reactor.

7430 Hazard Summary Report. Experimental Breeder Reactor II (EBR-II). L. J. Koch, et al. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5719, May 1957, 384 p. (UF767 Un3.1an Contin.)

Plant operation and performance. Enumeration and evaluation of possible hazards.

7431 Irradiation of Uranium-Fissium Alloys and Related Compositions. K. F. Smith. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5736, Sept. 1957, 55 p. (UF767 Un3.1an Contin.)

Irradiation results in the range near 0.5% burnup and 500 to 600 C are presented.

7432 The Fabrication of Fuel Subassemblies for the Borax-III Reactor. David E. Walker and Robert A. Noland. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5559, Jan. 1958, 35 p. (UF767 Un3.1an Contin.)

Each subassembly consists of a group of Al-clad Al-U alloy fuel plates arranged in an MTR-type array. An Al-0.6 wt.% β burnable poison strip is attached to each fuel subassembly.

7433 Dosimetry in the Argonne High-Level Gamma-Irradiation Facility. H. Gladys Swope. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5819, Jan. 1958, 12 p. (UF767 Un3.1an Contin.)

7434 Heat Transfer From Rods Normal to Subcooled Water Flow for Non-Boiling and Surface-Boiling Conditions up to and Including Burnout. S. P. Kezios and R. K. Lo. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5822, Jan. 1958, 146 p. (UF767 Un3.1an Contin.)

7435 The Time and Temperature Dependence of Thermal Stresses in Cylindrical Reactor Fuel Elements. K. R. Merckx. *ASME, Transactions*, v. 80, Feb. 1958, p. 505-509.

Method of calculating thermal stresses in cylindrical shapes uses a material model relating strain rate, temperature, strain, and stress. This is used to obtain the build-up and decay of the thermal stresses and strains in a solid-uranium fuel element operating in the temperature ranges of 100 to 350 C and 350 to 600 C during a 25-min. period of increasing power generation and 700-min. period of steady-state operation.

7436 Progress Relating to Civilian Applications During October, 1957. Russell W. Dayton and Clyde R. Tipton, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1232, Nov. 1957, 58 p. (UF767 U3b Contin.)

A progress report on Battelle work relating to civilian application of nuclear reactors.

7437 A Search for α-Particles From the Decay of Bi^{209}. E. P. Hincks and C. H. Millar. *Canadian Journal of Physics*, v. 36, Feb. 1958, p. 231--251.

No evidence was obtained of α-particles in the three m.e.v. region which could be unambiguously attributed to Bi, the experimental lower limit for the half-life thus determined being 2×10^{18} yr. Study of the energy available for the α-disintegration of Bi^{209} by the method of reaction cycles gives a value of 2.93 ± 0.11 m.e.v. For this disintegration energy the half-life of Bi^{209} predicted on the basis of α-decay theory and systematics is between 5×10^{19} and 5×10^{22} yr.

7438 (English and French.) CERN Symposium on High Energy Accelerators and Pion Physics. **Symposium du CERN sur les accélérateurs de haute énergie et la physique des mésons π. v. I.** High Energy Accelerators. **Les accélérateurs de haute énergie.** E. Regenstreif. **v. II.** Pion Physics. **La physique des mésons π.** A. Citron, G. von Dardel, B. d'Espagnat, Y. Goldschmidt-Clermont, and C. Peyrou, editors. 567 and 443 p. 1956. CERN European Organization for Nuclear Research, Geneva. (QC770 Eu74s Over.)

Papers deal with accelerating machines and their use; bubble chambers; over-compression and other track chambers; Čerenkov and other fast counter techniques; antiproton physics; nucleon-nucleon scattering; theoretical aspects of pion physics; questions of consistency in quantized field theories; pion-nucleon scattering; photo-production of pions; pion production by nucleons; and mesonic atoms.

7439* (French.) Experimental Study of Helical Lenses for Focusing μ-Mesons. **Étude expérimentale de lentilles quadrupolaires hélicoïdales pour la focalisation de mésons μ.** Mario Morpurgo and Albert Septier. *Comptes Rendus*, v. 245, no. 26, Dec. 23, 1957, p. 2496-2499.

A new intensive focusing system made of a large quadrupolar helical lens allows particles to be channeled along an extensive path and offers interesting filtering properties. Applications to a μ-meson channel.

7440* (French.) Radiation of Polonium 210. **Sur le rayonnement du polonium 210.** Marie Ader. *Comptes Rendus*, v. 246, no. 1, Jan. 6, 1958, p. 97-98.

The long path ionizing particles and the neutrons radiated by artificial Po had spectra identical to those of radiations from natural Po.

7441* (French.) Effect of the pH of Amidol Developers on the γ-Fogging of Nuclear Emulsions. **Influence du pH des révélateurs à l'amidol sur le voile γ des émulsions nucléaires.** Jacques Bermond and Maurice Scherer. *Comptes Rendus*, v. 246, no. 3, Jan. 20, 1958, p. 407-409.

Effects on the density of the fogging. Variations with depth in 400μ Ilford G5 emulsions treated at 5 C during 80, 90, 100, and 120 min.

7442 AEC and Contractor Source and Special Materials Management Representatives Meeting, June 1957. *Division of Nuclear Materials Management (U. S. Atomic Energy Commission)*, TID-7541(pt. 1), Dec. 1957, 147 p. (UF767 Un3ti Contin.)

Papers cover a broad range of subjects of accounting and auditing, measurements, and statistics in the control of SS materials.

7443* (German.) Power Reactors. **Leistungsreaktoren.** M. Ledinegg, J. Mairhofer, and H. Sockel. *Elektrotechnik und Maschinenbau*, v. 75, no. 2, Jan. 15, 1958, p. 28-37.

Design, limitations, and maximum output of various types of reactors with molten metal (mostly Na and K), He, D_2O, and other cooling agents.

7444* (French.) Plutonium Extraction. **L'extraction du Plutonium.** P. Regnaut. *Énergie Nucléaire*, v. 1, no. 4, Oct.-Dec. 1957, p. 196-206.

Formation of Pu in piles. Difficulties in extracting from irradiated U bars. Advantages and disadvantages of aqueous phase methods and dry processes.

7445 The Wigner Effect: Factors in the Design of Graphite Moderators for Nuclear Reactors. P. J. Grant. *Engineering*, v. 185, Jan. 24, 1958, p. 120-121.

Properties of graphite. Effects of irradiation on physical properties.

7446 Application of Digital Techniques to Reactor Control Systems. *Ford Instrument Company (U. S. Atomic Energy Commission)*, NYO-8500, Feb. 1957, 11 p; NYO-8501, June 1957, 35 p. (UF767 U3ny Contin.)

Design of a digital system to provide count rate and period information in the reactor start up channel, and a control rod

position indicator based upon an electromagnetic delay line principle. Areas of profitable study; effects of substituting transistor switching circuits in an existing control system from the viewpoint of reliability, maintenance, size, and flexibility; application of ultrasonics to reactor instrumentation.

7447 Application of Digital Techniques to Reactor Control Systems. *Ford Instrument Company (U. S. Atomic Energy Commission),* NYO-8502, Oct. 1957, 46 p. (UF767 U3ny Contin.)

A system to utilize digital techniques for start-up control is discussed with emphasis on system approach, output display, size, weight, cost, and information smoothing techniques.

7448 Method of Estimating Dosage to Ground From a Radioactive Cloud. C. C. Gamertsfelder and R. L. Waterfield. *General Electric, Atomic Products Division (U. S. Atomic Energy Commission),* APEX-348, Oct. 1955, 27 p. (UF767 Un3.1ap Contin.)

Mathematical expressions are developed for the radiation dose to a point on the ground following the instantaneous emission of a point source of radiation.

7449 Annual Report, Plutonium Recycle Program, Fiscal Year 1957. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-52000, Sept. 1957, 106 p. (UF767 Un3.1hw Contin.)

Reports work in Pu utilization analyses and in chemical processing, fuel element, and reactor technology.

7450 High Temperature, High Pressure Nozzle-to-Tube Connections for the 1706 KER Facility. D. R. Doman. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-53404, Nov. 1957, 19 p.

Threaded connections with O-ring seals made from solid stainless steel wire proved best of the three types tested. Tapered thread connections were stronger than straight thread connections.

7451 Irradiation of Organic Reactor Coolants in Dynamic Systems. D. R. de Halas. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-53717, Nov. 1957, 42 p. (UF767 Un3.1hw Contin.)

A rate law was derived for the combination of radiolytic and pyrolytic damage to organic coolants in a dynamic system. Rate constants were measured for purely radiolytic damage to MIPB, ortho- and meta-terphenyl, and biphenyl.

7452 A Simple Monitor for Airborne Alpha Particles. R. D. Hiebert, R. N. Mitchell, and D. B. Tod. *Institute of Radio Engineers, Transactions on Nuclear Science,* v. NS-4, Dec. 1957, p. 66-69. (TK1 In6.6ns Vis.)

The single-channel system can detect activity concentrations of ten times maximum permissible level for Pu and gives indication of accumulated activity at 10-min. intervals.

7453 Isotopes, an Eight-Year Summary of U. S. Distribution and Utilization. 357 p. 1955. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (QD466 U3i)

Use of isotopes in medicine, agriculture, and industry. Includes over 7000 open-literature references.

7454* (Russian.) A Scheme of Lu^{171} Decay. **O skheme raspada Lu^{171}.** K. Ia. Gromov, B. S. Dzhelepov, A. G. Dmitriev, and B. K. Preobrazhenskii. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, no. 12, Dec. 1957, p. 1573-1575.

Conversion electron spectrum of Lu (isolated from Hf) which is formed in the reaction on Ta.

7455* (Russian.) $0^+ \rightarrow 0^+$ Transition Into Zr^{90}. **$0^+ \rightarrow 0^+$ Perekhod v Zr^{90}.** T. Iuasa, Zh. Laberig-Frolova, and L. Fevre. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, no. 12, Dec. 1957, p. 1576-1579.

Search for γ-quanta, in the range of 1.7 m.e.v. especially of the internal conversion electrons, and the positrons corresponding to this energy of γ-quanta.

7456* (Russian.) Study of Pr^{144}, Rh^{106}, and Cs^{134} Decay by Means of a Luminescent Spectrometer. **Izuchenie raspada Pr^{144}, Rh^{106}, Cs^{134} pri pomoshchi liuminestsentnogo spektrometra.** E. I. Firsov and A. A. Bashilov. *Izvestiia Akademii Nauk, Seriia Fizicheskaia,* v. 21, no. 12, Dec. 1957, p. 1633-1640.

Gives energy spectrum lines with approximate meaning of the corresponding intensities and the decay scheme.

7457* (Russian.) Relative Intensity of Po^{210} γ-Quanta. **Ob otnositel'noi intensivnosti γ-kvantov Po^{210}.** V. V. Ovechkin. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 21, no. 12, Dec. 1957, p. 1641-1642.

Study of the γ-quanta with energy of 803 k.e.v. emitted from the first excitation of Pb^{206} level during the α-decay of Po^{210}.

7458 Radiation Discrimination With Photoconducting Crystals. Y. T. Sihvonen and D. R. Boyd. *Journal of Applied Physics,* v. 29, Jan. 1958, p. 85-88.

Mathematical analysis of the discriminatory properties of an array of photoconducting receivers subjected to an influx of photons. Response differences can be used to resolve two classes of photons differing in energy into a spectrum.

7459 Energy of Interaction Between Two Excited Hydrogen Atoms in Either 2*s* or 2 *p* States. Bruno Linder and Joseph O. Hirschfelder. *Journal of Chemical Physics,* v. 28, Feb. 1958, p. 197-207.

A complete set of potential energy curves is given for intermediate and large internuclear separations. These include first- and second-order perturbation energies. The first-order perturbation energies are obtained by using exact integrals and properly symmetrized wave functions with an effective nuclear charge of unity.

7460 The Preparation of Bismuth for Use in a Liquid-Metal Fuelled Reactor. G. W. Horsley. *Journal of Nuclear Energy,* v. 6, nos. 1-2, 1957, p. 41-52.

Study of the Bi-O-Cl system suggests that the Cl concentration may be reduced to about 13 p.p.m. by oxidation and filtration, the residual Cl remaining in solution as BiOCl.

7461 Neutron Diffusion in a One-Dimensional Uranium-Water Lattice. Ya. V. Shevelev. *Journal of Nuclear Energy,* v. 6, nos. 1-2, 1957, p. 132-141. (Translated from *Atomnaia Energiia,* v. 2, 1957, p. 224.)

Calculation of the diffusion lengths in a one-dimensional uranium-light-water lattice for thermal neutrons diffusing parallel and perpendicular to the infinite slabs of moderator.

7462 The Thermal Neutron Absorption Cross-Section and Resonance Absorption Integral of ^{240}Pu. P. A. Krupchinsky. *Journal of Nuclear Energy,* v. 6, nos. 1-2, 1957, p. 155-162. (Translated from *Atomnaia Energiia,* v. 2, 1957, p. 240.)

7463* (French.) Neutron Propagation in a Perfect Crystal of Finite Dimensions. **Propagation des neutrons dans un cristal parfait de dimensions finies.** André Herpin. *Journal de Physique et le Radium,* v. 18, no. 12, Dec. 1957, p. 649-655.

Study of the dynamic theory of neutron propagation. For neutrons the starting point is the neutron-nucleus interaction, considered as a point. Refraction indices for all waves propagating close to a Bragg reflexion. Effect of the thermal motion.

7464* (French.) Electronic Simulator for Study of Radioactive Phenomena. **Simulateur électronique pour l'études des phénomènes radioactifs.** Monique Gutmann and Robert Comte. *Journal de Physique et le Radium (Suppl.),* v. 18, no. 12, Dec. 1957, p. 158A-162A.

Details of an apparatus simulating the evolution with time of a number of atoms and radiation intensity of each member of a radioactive family. Recording with a cathode oscillograph. Possible application to artificial radioactive families and nuclear reactor poisoning.

7465 A UO_2-Bismuth System as a Reactor Fuel. D. H. Ahmann, et al. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1877, July 1957, 21 p. (UF767 Un3.1ka Contin.)

Capsule experiments made with UO_2-Bi slurries at 500 to 600 C indicate that Ti is the best additive to promote the wetting of UO_2 by Bi. Ten to 12 wt% UO_2 can be uniformly dispersed in Bi.

7466 Tertiary Effects of Blast—Displacement. R. V. Taborelli and I. G. Bowen. *Lovelace Foundation for Medical Education and Research (U. S. Atomic Energy Commission),* ITR-1469, Sept. 1957, 36 p. (UF767 Un3.1it Contin.)

Phototriangulation was used to determine the velocity and distance of translation of anthropomorphic dummies and equivalent spheres caused by blast winds.

7467 Production of High Temperatures and Nuclear Reactions in a Gas Discharge. P. C. Thonemann, et al. *Nature*, v. 181, Jan. 25, 1958, p. 217-220.

It is possible to produce a stable highly ionized plasma isolated from the walls of a toroidal tube. Hydrogen gas has been maintained in a state of virtually complete ionization with a particle density lying between 10^{13} and 10^{14} per cm.^{3}, for times of milliseconds.

7468 A Stabilized High-Current Toroidal Discharge Producing High Temperatures. N. L. Allen, et al. *Nature*, v. 181, Jan. 25, 1958, p. 222-224.

7469* Thermonuclear Fusion. The Task and the Triumph. George Thomson. *New Scientist*, v. 3, Jan. 30, 1958, p. 11-13.

The author, who directed the first work in Britain aimed at a controlled release of energy from the fusion of atoms, tells of the stages which led to the success at Harwell.

7470* Transient Temperatures in Nuclear Reactors Cooled by Liquids. S. V. Manson and Sherwood B. Menkes. *New York Academy of Sciences, Transactions*, v. 20, Nov. 1957, p. 51-71.

Expressions are derived for transient temperatures of wall and fluid in a source-containing channel cooled by a liquid. The temperature solutions apply to warm-up, start-up and, under some conditions, power-change of core-moderated reactors and provide a basis for calculation of thermal stress and temperature-dependent nuclear reactivity.

7471 HASL Aerial Survey System. M. E. Cassidy, R. T. Graveson, and H. D. LeVine. *New York Operations Office, Health and Safety Laboratory (U. S. Atomic Energy Commission)*, NYO-2071, July 1957, 53 p. (UF767 U3ny Contin.)

The HASL "Top Hat" system measures radiation intensity, in an aircraft, at any altitude up to 1500-ft. Data is continuously compensated to the reading that would be obtained if measurements were taken at 3-ft. from the ground surface. It will record ground radiation field intensities from 0.01 mr/hr. to 1000 r/hr.

7472 A Further Evaluation of the Calder Hall Type of Nuclear Power Plant. W. F. Banks. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1955, June 1957, sections individually paged. (UF767 Un3.1na Contin.)

Plant optimization studies and cost estimates of the reference design for a natural U, graphite moderated, gas-cooled reactor and power plant.

7473 Graphical Aids in the Calculation of the Shielding Requirements for Spent U^{235} Fuel. R. L. Ashley. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1992, Nov. 1957, 59 p. (UF767 Un3.1na Contin.)

7474 Electrical Analog Application to a Reactor Safety Device Program. Charles C. Weeks. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-2003, Nov. 1957, 27 p. (UF767 Un3.1na Contin.)

An electrical analog was used to investigate thermal transient behavior of the fuse component of the AI Mark II Reactor Safety Element. Experimental results are given for thermal relaxation time determinations as well as fuse delay times for exponential transients representing reactor excursions.

7475 Development of the OMRE Control-Safety Rod. H. Strahl. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-2287, Dec. 1957, 34 p. (UF767 Un3.1na Contin.)

The Organic Moderated Reactor Experiment control-safety mechanism utilizes an electro-mechanical drive in conjunction with a rack and pinion for insertion or withdrawal of rods. The nuclear poison material consists of B_4C powder compacted and sealed in AISI 4130 tubing.

7476 The Experimental Development of a Fuel Handling System for the Sodium Reactor Experiment. W. J. Hallett and J. A. Leppard. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-2004, Jan. 1958, 48 p. (UF767 Un3.1na Contin.)

Emphasis is placed on the difficulties which arose and the specific means utilized to overcome them. The equipment and procedure available at the conclusion of the development effort would permit removal and replacement of a fuel element in the SRE core in about 54 min. The amount of Na carried over by a spent fuel element was found to be between 0.1 and 0.25 lb.

7477 Reactor Physics Quarterly Progress Report, April-June, 1957. M. Carl Walske. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-2058, Jan. 1958, 8 p. (UF767 Un3.1na Contin.)

The transport mean free path of thermal neutrons in diphenyl was measured by the boron poisoning method to be 0.80 ± 0.05 cm. This permits calculation of the horizontal buckling for the U rod lattices in the 2¼ ft. diameter tank, the result being 47.5 ± 0.1 m^{-2}. This leads to values of 1.39 ± 0.9 and 17.8 ± 0.5 m^{-2} respectively for the bucklings of the natural (0.72%) and enriched (0.91%) U lattices for which the diphenyl moderator-to-fuel volume ratio is 4.

7478* The Development of Magnetic Ion Sources for an Electromagnetic Isotope Separator. K. O. Nielsen. *Nuclear Instruments*, v. 1, Dec. 1957, p. 289-301.

Survey of several ion sources of the magnetic type, which have been used in connection with the electromagnetic isotope separator in Copenhagen.

7479* Efficient Detector for High Energy Neutrons. N. E. Booth and B. Ledley. *Nuclear Instruments*, v. 1, Dec. 1957, p. 345-350.

A detector of neutrons in the energy range 400-900 m.e.v. was constructed. At 800 m.e.v. its efficiency is 1-2%.

7480* Beta-Gamma Correlation and Polarization of Particles in the Beta Decay of Oriented Nuclei in Connection With Parity Non-Conservation. A. Z. Dolginov. *Nuclear Physics*, v. 5 ,Feb. 1958, p. 512-529.

A formula for the angular distribution and polarization of β-particles emitted by polarized or aligned nuclei is derived; the formula is valid for β-transitions of any order of forbiddenness.

7481* Mass Transfer in Liquid Metal Systems. I. Thermal Gradient Transfer. J. W. Taylor. *Nuclear Power*, v. 3, Feb. 1958, p. 53-57.

Thermal convection and dynamic loop tests. Dissolution process. Precipitation stage.

7482* The Calder Hall Graphite Structure. E. Long. *Nuclear Power*, v. 3, Feb. 1958, p. 58-63.

Arranging 13,000 graphite blocks to take account of thermal expansion, Wigner growth, and neutron leakage combined to pose a formidable design problem.

7483 Fast Neutron Scattering From Thick Slabs. T. D. Strickler, H. E. Gilbert, and J. A. Auxier. *Nuclear Science and Engineering*, v. 3, Jan. 1958, p. 11-18.

An experimental evaluation was made of the Po-Be fast neutron absorbed dose albedos for concrete, water, and Al. By assuming neutrons are scattered isotropically in the center of mass system, a good fit to Plesset's albedo theory was obtained.

7484 Estimation of Charge Life for Reactors With Small Cores. H. L. McMurray, A. V. Grimaud, and G. H. Hanson. *Nuclear Science and Engineering*, v. 3, Jan. 1958, p. 38-46.

An expression for the above is derived in terms of a model which assumes that enough uniformly distributed poison is always present to keep the reactor critical with control rods withdrawn.

7485 Heat Transfer in Heterogeneous Circulating-Fuel Reactors. H. F. Poppendiek and L. D. Palmer. *Nuclear Science and Engineering*, v. 3, Jan. 1958, p. 85-106.

Radial temperature distributions within the cores of those reactors having elementary channel and circular pipe geometries are described mathematically; uniform and nonuniform radial volume-heat-source distributions are considered.

7486 Nuclear Stripping Reactions. S. T. Butler and O. H. Hittmair. 130 p. 1957. John Wiley & Sons, New York. (QC721 B97n)

Deuteron stripping and related direct reactions; coulomb and nuclear corrections; stripping angular correlations; polarization of outgoing particles; boundary matching; matrix formulation; surface reactions.

7487 Thermodynamics of Gas-Cooled Reactors. Gilbert B. Melese. *Nucleonics*, v. 16, Feb. 1958, p. 72-76.

Simplification of the equations governing such a reactor so as to obtain simple relations among the net electrical output and the main variables.

7488 United States and Britain Reveal Fusion Advances. *Nucleonics*, v. 16, Feb. 1958, p. 90 + 8 pages.

Condensed versions of the descriptions of thermonuclear devices and pinch-effect experiments as released by the U. S. AEC and U. K. AEA on January 24, 1958.

7489 Neutron, Gamma Measurements for In-Pile Power Monitoring. A. C. Lapsley. *Nucleonics*, v. 16, Feb. 1958, p. 106 + 2 pages.

Development of neutron- and γ-sensitive monitors for use inside reactors. The neutron monitor uses a thermocouple to measure temperature differentials generated in a U-Al button, and the γ monitor uses an ionization chamber. Both monitors are insensitive to radiation damage and have a long life in piles that operate at a high power density.

7490 Isotope Dilution, α-Spectrometer for U and Th Determination. L. E. Howard. *Nucleonics*, v. 16, Feb. 1958, p. 112 + 5 pages.

Development of method that uses a gridded ion chamber as a simple α-spectrometer and an isotope-dilution technique to determine concentrations.

7491* (English.) **Polarization Effects in Bremsstrahlung.** G. Böbel. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1241-1251.

The differential cross-section of bremsstrahlung is written as a sum of eight terms, each correlating the different polarizations of the electron in the initial and final states and of the emitted photon. Formulas of Bethe and Heitler, May, Gluckstern, and others as particular cases. Emission of circularly polarized photons from electrons having longitudinal and transversal spin respectively.

7492* (English.) **Dispersion Relations for Fermions.** Riazuddin. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1252-1267.

Scattering of two fermions are derived in a way similar to that used for fermion-boson scattering. The relations are written for functions which can be expressed in terms of the phase shifts.

7493* (English.) **Analysis of Processes Involving Baryons, Pions and Heavy Mesons.** D. Amati and B. Vitale. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1282-1291.

The role played by the fields present in any strong interactions is analyzed by means of dispersion relation techniques. Effects of virtual states in physical processes where only a few of the many interacting fields are present in the initial and final states as real particles.

7494* (English.) **Electron Motion in Synchrotrons in the Presence of Radiation.** A. N. Matveev. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1305-1317.

Effects of the above are discussed. A stochastic theory of betatron and phase oscillations, induced by radiation fluctuations, is presented.

7495* (English.) **On the Correction of the Intensity of Cosmic Rays at Sea Level by Means of Atmospheric Data.** U. Fasoli and J. Pohl-Rüling. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1339-1355.

Measurements have been carried out at Padua using three different sets of apparatus. An analysis is made of the atmospheric data, and the effect of the seasonal variation on the correlation coefficients.

7496* (English.) **The Čerenkov Effect Produced by Single Particles in Gases.** A. Ascoli-Balzanelli and R. Ascoli. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1392-1408.

A high efficiency may be obtained with small detectors, provided that each pulse due even to one photoelectron may be detected. Data show that such a photomultiplier is possible.

7497* (English.) **On the Decay of ^{119}Sn and ^{121}Te.** K. S. Bhatki, R. K. Gupta, S. Jha, and B. K. Madan. *Nuovo Cimento*, v. 6, ser. 10, no. 6, Dec. 1957, p. 1461-1468.

By the coincidence studies of ^{119}Sn and by studying ^{119}Sn sources completely separated from ^{119}In, the existence of a level at 650 k.e.v. in ^{119}In resulting in the emission of 258 k.e.v. γ-ray has been established. This state is fed by the electron capture transition in ^{119}Sn to the extent of about 3.5%.

7498* (English.) **Multiple Scattering Measurements in Nuclear Emulsions.** S. Rosendorff and Y. Eisenberg. *Nuovo Cimento*, v. 7, ser. 10, no. 1, Jan. 1958, p. 23-38.

7499* (English.) **Relativistic Increase of Energy Loss by Ionization in Gases.** R. G. Kepler, C. A. D'Andlau, W. B. Fretter, and L. F. Hansen. *Nuovo Cimento*, v. 7, ser. 10, no. 1, Jan. 1958, p. 71-86.

Measurements of ionization loss by relativistic charged particles were made in He, Ar, and Xe by the method of counting drops in a cloud chamber.

7500 A Modification of the Spherical Harmonics Method in Neutron Transport Theory. A. Sauer. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2456, Feb. 1958, 13 p. (UF767 U3o Contin.)

The oscillatory character and the consequent poor convergence of the spherical harmonics method which arises when it is applied to a discontinuous problem is modified. The new method is applied to the plane Milne problem.

7501 Scintillation Spectrometry Gamma-Ray Spectrum Catalogue. R. L. Heath. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16408, July 1957, 24 p. (UF767 Un3.1 id Contin.)

This collection of γ spectra contains samples of the response of NaI(Tl)scintillation detectors to a large number of the more frequently encountered radioactive nuclides.

7502 Hydraulic Flow Calculations for MTR-ETR Experiments. Standard Practices Manual. R. B. VanSice. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16368, Nov. 1957, 69 p. (UF767 Un3.1id Contin.)

Sample calculations were made for flow and pressure drop in an MTR fuel element, a four-hole MTR reflector A-piece with all holes full of slugs in experimental X-baskets, a four-hole MTR reflector A-piece with three holes full and one hole completely empty, a one-hole reflector A-piece full, and a four-hole A-piece with three holes full and the fourth hole containing one 7-in. slug with lead attached.

7503 Plasma Diffusion in a Magnetic Field. M. N. Rosenbluth and A. N. Kaufman. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 1-5.

Equations governing the diffusion of fully ionized plasma across a magnetic field are derived. It is assumed that macroscopic quantities vary across an ion radius of gyration, and that the interparticle collision frequency is less than the gyration frequency.

7504 Equilibrium Charges of Fission Fragments in Gases. Clyde B. Fulmer and Bernard L. Cohen. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 94-99.

A magnetic analysis method was used to measure the equilibrium charges of median-mass light and heavy fission fragments in H_2, He, air, and A, and mass-97 fragments in He for wide ranges of fragment velocity and gas pressure. The data for the fragments in H_2, air, and A yield estimates which agree within 25%.

7505 Studies of Rare Earth Alpha Emitters. Kenneth S. Toth and John O. Rasmussen. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 121-125.

A series of bombardments using α particles from the Berkeley 60-in. cyclotron lead to the discovery and mass assignment of two new α-emitting isotopes, Dy^{153} (5 hr) and Dy^{154} (13 hr).

7506 Capture-to-Fission Ratios for Fast Neutrons in U^{235}. B. C. Diven, J. Terrell, and A. Hemmendinger. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 144-150.

The ratio neutron capture cross section to the neutron-induced fission cross section, has been measured as a function of neutron energy, and is approximately 0.190 to 0.116 E_n.

7507 Radiative Meson-Nucleon Scattering. R. E. Cutkosky. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 209-217.

The static-source model of the pion-nucleon interaction is applied to the problem of the bremsstrahlung emitted in pion-nucleon scattering.

7508 Bremsstrahlung Cross-Section Measurements for 50-kev Electrons. J. W. Motz and R. C. Placious. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 235-242.

The dependence of the bremsstrahlung differential cross section on photon energy and angle for 50-k.e.v. electrons incident on a 10-$\mu g/cm^2$ Au target and a 17-$\mu g/cm^2$ Al target were determined with a scintillation spectrometer at angles ranging from 10 to 140°.

7509 Energy Levels of Polonium-210. R. W. Hoff and J. M. Hollander. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 447-456.

7510 New Isotope, Sulfur-38. D. R. Nethaway and A. A. Caretto, Jr. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 504-508.

A new isotope of sulfur, S^{38}, was produced by the $(\alpha,3p)$ reaction on Cl^{37}. It has a half-life of 172 ± 1 min., and decays by the emission of two β groups with end-point energies of 1.1 and 3.0 m.e.v.

7511 Radiation Damage Experiments and the Nature of Thermal Spikes in III-V Compounds. Ulrich Gonser and Boudewyn Okkerse. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 663-667.

Specimens of GaSb were irradiated at liquid N temperature with 12-m.e.v. deuterons. The results of resistivity measurements during irradiation and of X-ray observations after the irradiation suggest very strongly that thermal spikes are introduced under these conditions.

7512 Relaxation Effects for Coupled Nuclear Spins. Robert C. Rempel. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 831-839.

Nuclear relaxation effects in molecules containing several coupled spins are treated by a generalization of the method of Wangsness and Bloch. Variations in line shape and structure for two coupled spin-½ nuclei, as various parameters are changed from one extreme to another, are derived and plotted graphically.

7513 Investigation of Excited States in Be^8 by Alpha-Particle Scattering From He. R. Nilson, W. K. Jentschke, G. R. Briggs, R. O. Kerman, and J. N. Snyder. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 850-860.

7514 Positron Decay of Cu^{59} and Cu^{61} and Energy Levels in Ni^{59} and Ni^{61}. J. W. Butler and C. R. Gossett. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 863-871.

The energies and relative intensities of the γ-rays following the positron decay of Cu^{59} were determined. The energies are 0.343 ± 0.004, 0.463 ± 0.010, 0.872 ± 0.005, 1.305 ± 0.005, and 1.70 ± 0.01 m.e.v., with respective relative intensities of 16 ± 3, 15 ± 5, 29 ± 4, 36 ± 4, and 4 ± 2%. The half-life of Cu^{59} was measured to be 81.5 ± 0.5 sec. The energies of ground-state transition γ-rays following the positron decay of Cu^{61} were measured as 0.070 ± 0.002, 0.282 ± 0.003, 0.659 ± 0.003, and 1.192 ± 0.005 m.e.v.

7515 Radioactive Decay of Se^{69}. Robert G. Cochran and William W. Pratt. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 878-883.

7516 Scattering of Fast Neutrons From C^{12} and F^{19}. J. E. Wills, Jr., J. K. Bair, H. O. Cohn, and H. B. Willard. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 891-897.

7517 Yields, Angular Distributions, and Polarization of Gamma Rays From Coulomb Excitation. F. K. McGowan and P. H. Stelson. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 901-916.

7518 Neutron Total Cross Sections in the kev Region by Fast Time-of-Flight Measurements. W. M. Good, J. H. Neiler, and J. H. Gibbons. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 926-933.

A new method employing millimicrosecond time measurement was used to study neutron total cross sections in the 2- to 30-k.e.v. energy range. The method was applied to the nuclides Na^{23}, Al^{27}, P^{31}, K^{39}, K^{41}, Rb^{85}, Rb^{87}, Sr^{86}, Sr^{88}, Y^{89}, Bi^{209}, and to natural Ti, Se, and Pb.

7519 Velocity-Dependent Forces and Nuclear Structure. II. Spin-Dependent Forces. Marcos Moshinsky. *Physical Review* v. 109, ser. 2, Feb. 1, 1958, p. 933-941.

An exploration for velocity-dependent forces, starting with the two-body spin-orbit force, and considering also the simplest velocity-dependent forces that depend on the second power of the momentum, which include the velocity-dependent tensor force recently introduced by Breit.

7520 Nucleonic Binding States in Nonspherical Nuclei: Asymptotic Representation. A. J. Rassey. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 949-957.

An alternative description is given for Nilsson's analysis of nucleonic motion in a strongly deformed nuclear field. The aim is to obtain the single-particle states for the region of strong deformation in terms of a representation which is especially suited for that region in contrast to the spherical representation used by Nilsson.

7521 Momentum Spectrum of Positrons From the Decay of μ^+ Mesons. Lawrence Rosenson. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 958-972.

The detecting instrument was a 20-atm. hydrogen-filled diffusion cloud chamber, operated in a magnetic field of 7000 gauss.

7522 Magnetic Moment of the Free Muon. T. Coffin, R. L. Garwin, S. Penman, L. M. Lederman, and A. M. Sachs. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 973-979.

The magnetic moment of the positive μ meson was measured in several target materials by a magnetic resonance technique. Muons were brought to rest with their spins parallel to a magnetic field.

7523 Radiation Effects in Solids. G. J. Dienes and G. H. Vineyard. v. II. 226 p. 1957. Interscience Publishers, New York. (QC795 D56r)

Deals largely with the physics of radiation effects. Radiation of X-ray and higher energies is primarily considered.

7524 Gas-Recoil Fast Neutron Spectrometer. R. E. Benenson and M. B. Shurman. *Review of Scientific Instruments*, v. 29, Jan. 1958, p. 1-9.

Geometrical considerations; design and construction of the spectrometer electronic circuit operation; operation and experimental results with monoenergetic neutrons; measurements on multigroup spectra.

7525 Apparatus for Measuring the Energy Spectra of Mass-Selected Particles in Coincidence With Fission. R. H. Stokes, John A. Northrop, and Keith Boyer. *Review of Scientific Instruments*, v. 29, Jan. 1958, p. 61-64.

Features a mass identifier which operates over a range of 5 to 25 m.e.v. and gives good separation of protons, deuterons, and tritons; depends on measuring the particle energy loss, $\triangle E$, in a transmission counter and the residual energy, E, in a separate counter.

7526 Extension of the Safe Geometric Parameters to Slightly Enriched Uranium. C. E. Newlon. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1370, Jan. 1958, 9 p. (UF767 Un3.1k Contin.)

Use is made of a method of buckling comparisons to extend the safe geometric criticality parameters of the infinite cylinder, infinite slab, and the sphere, to U of enrichments between 0.72 and 5% U-235 assays.

7527 Development of Isotope Production in the USSR. Yu S. Frolov, V. V. Bochkarve, and E. E. Kulish. *U. S. Atomic Energy Commission*, AEC-tr-3093, 1957, 14 p. (UF767 Un3.1ae Contin.)

(Translated from the Russian.) Discussion of the following topics: raw material, containers used for irradiation, duration of irradiation, methods of isotope production, storage of isotope containers and operations with radiation sources, assortment of radiation sources and its growth, production technology and assortment of preparations and tracer compounds, and stable isotopes.

7528 Theoretical Possibilities and Consequences of Major Accidents in Large Nuclear Power Plants. *U. S. Atomic Energy Commission*, WASH-740, Mar. 1957, 105 p. (UF767 Un3.1w Contin.)

A study of possible consequences if certain assumed accidents, theoretically possible but highly improbable, were to occur in large nuclear power plants.

7529 Fast Reactor Information Meeting. *U. S. Atomic Energy Commission, Division of Reactor Development,* TID-7548, Nov. 1957, 49 p. (UF767 Un3ti Contin.)

Brief descriptions of a number of reactor programs and developments in reactor design and analysis, safety, fuel cycles, and components.

7530 Attenuation of Scattered Cobalt 60 Radiation in Lead and Building Materials. R. T. Mooney and C. B. Braestrup. *U. S. Atomic Energy Commission, Research and Development Report,* NYO-2165, Oct. 1957, 24 p. (UF767 U3ny Contin.)

7531 (n,2n) Study of Be^9. Dwight S. Young. *University of California, Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission),* LA-2158, Jan. 1958, 19 p. (UF767 U3La Contin.)

The (n,2n) reaction in Be was studied by means of different thicknesses of Be around neutron sources, and different thicknesses of paraffin around a boron-lined detecting chamber.

7532 UCRL Design Data of General Interest. W. M. Brobeck and D. T. Scalise. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission),* UCRL-3687, Sept. 1957, sections individually paged. (UF767 U3u Contin.)

A collection of data sheets useful in radiation laboratory design work.

7533 Measurement of Beam Current in the Bevatron by Induced Voltages. John T. Lavrischeff. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission),* UCRL-8033, Oct. 1957, 40 p. (UF767 U3u Contin.)

Problems associated with handling the beam signal. Design principles involved in detection, amplification, and isolation of the signal. Calibration techniques, signal distribution facilites, and control features. The systems described are stable and provide the desired information with a minimum of maintenance and operational difficulty.

7534 Release of Fission Gases From Irradiated Uranium Dioxide. I. Apparatus for the Measurement of Fission Gas Release From Fuel Materials During Pile Irradiation. J. M. Markowitz, R. C. Koch, and J. A. Roll. *Westinghouse Electric Corporation, Bettis Plant, (U. S. Atomic Energy Commission),* WAPD-180, 29 p. (UF767 Un3.1wa Contin.)

7535 Shippingport Issue. *Westinghouse Engineer,* v. 18, Mar. 1958, 64 p.

Eight papers describing the Shippingport Atomic Power Station, covering basic concepts of the PWR plant, reactor and coolant loop design and operation, plant control, fuel handling, radioactive waste disposal, safety considerations, and personnel and training.

7536* (German.) Optical Model for the Scattering of K^--Mesons by Complex Nuclei. **Optisches Modell für die Streuung von K^--Mesonen an Kernen.** P. Mittelstaedt. *Zeitschrift für Naturforschung,* v. 12a, no. 12, Dec. 1957, p. 947-955.

The real and the imaginary parts of the optical potential are determined by a comparison with the experimental results of the Goettingen and of the Bern plate group from the angular distribution of the elastic scattering and also from the energy distribution of the inelastically scattered K^--mesons by means of the Goldberger-method.

7537* (German.) The Diffusion-Cooling Effect. **Der Diffusions-Kühlungseffekt.** K. H. Beckurts. *Zeitschrift für Naturforschung,* v. 12a, no. 12, Dec. 1957, p. 956-959.

The equilibrium spectrum of thermal neutrons in a finite scattering medium is calculated on the basis of a simplified model for the medium. Diffusion effects can cause an important modification of the Maxwell velocity distribution.

7538* (German.) The β-Transition Between the Ground States of Co^{58} and Fe^{58}. **β-Übergang zwischen den Grundzuständen von Co^{58} and Fe^{58}.** H. Daniel. *Zeitschrift für Physik,* v. 150, no. 2, 1958, p. 144-148.

The β^+-spectrum of Co^{58} was tested with a double-focusing β-spectrometer. A double forbidden transition between the ground states of Co^{58} and Fe^{58}, with the approximate intensity of 6×10^{-6} per decay was found.

See also: **6213** (agricultural research uses of atomic energy); **6255** (biological effects of whole-body gamma irradiation); **6322** (tracer applications in organic reactions); **6347** (UO_2 fuel cores); **6479** (Np chemistry); **6487** (radiolysis of $FeSO_4$); **7026** (industrial heat reactors); **7095** (pumping liquid metals); **7135** (Mg in nuclear engineering); **7139** (high-boron steels for nuclear reactors); **7157** (corrosion in nuclear reactors); **7411** (ultrasonic inspection of uranium fuel elements); **7582** (atomic physics constants); **7666** (regional survey program for radioactive contamination); **7673** (radioactive waste treatment).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

7539* **Measuring Organizational Performance.** Rensis Likert. *Harvard Business Review,* v. 36, Mar.-Apr. 1958, p. 41-50.

Progress in the social sciences now enables management to gage the results of different types of supervision in terms of production and human assets.

7540* **Increasing the Productivity of Scientists.** Irving Hirsch, William Milwitt, and William J. Oakes. *Harvard Business Review,* v. 36, Mar.-Apr. 1958, p. 66-76.

An analysis of the present utilization of scientists and methods for increasing productivity in the future.

7541* (Swedish.) Automation and Human Factors. **Automatiseringen och de mänskliga faktorerna.** E. S. Strandh. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning,* v. 28, no. 8, 1957, p. 331-335.

Definition of, and fields covered by "human engineering", "humanation", and "information storage and retrieval". Description of the Magna-card system.

7542* **An Investigation of Some Quantitative Relationships Between Break-Even Point Analysis and Economic Lot-Size Theory.** Wayland P. Smith. *Journal of Industrial Engineering,* v. 9, Jan.-Feb. 1958, p. 52-57.

7543 Management Aids for Small Business. Edward L. Anthony, editor. 80 p. 1957. Small Business Administration, Washington, D. C. (HD28 M31)

Income tax reporting; pricing new products; setting up sales territories; wage incentives; streamlining office systems; psychological testing; profits from unpatentable ideas. How marketing research, field warehousing, independent laboratories, and food brokers help small business.

7544* **On a Class of Minimum-Cost Problems.** William Karush. *Management Science,* v. 4, Jan. 1958, p. 136-153.

Mathematical methods were developed to determine a program of future levels of activity subject to known future requirements, which will minimize the total cost of the projected program over the entire planning interval.

7545* **Evolution of Linear Programming Computing Techniques.** Wm. Orchard-Hays. *Management Science,* v. 4, Jan. 1958, p. 183-190.

ORE AND MATERIALS BENEFICIATION

7546 Hardening of Iron-Ore Pellets. B. Seweryński and T. Wlazińska. *Henry Brutcher Translation No.* 3706, 6 p. (Abridged from *Prace IMH (Poland),* v. 7, 1955, p. 30-34.) Henry Brutcher, Altadena, Calif.

The successive stages of hardening. Firing in various atmospheres. Influence of chemical composition on firing process. Strength of fired pellets as function of grain size and amount of quicklime added.

7547 Pelletizing of Iron Ores. Z. Krotkiewski and B. Seweryński. *Henry Brutcher Translation No.* 3707, 11 p. (Abridged from *Prace IMH (Poland),* v. 7, 1955, p. 101-105.) Henry Brutcher, Altadena, Calif.

Advances in production of self-fluxing sinters; fluxed sinters vs. "bonded" sinters. Briquetting of magnetite concentrates. Polish pelletizing practice.

7548* (French.) Extraction of Uranium by Means of a Centrifugal Extractor. **L'extraction de l'uranium par extracteur centrifuge.** A. De Troy. *Énergie Nucléaire*, v. 1, no. 4, Oct.-Dec. 1957, p. 191-195.

Use of a 3-stage counter-current centrifuge for liquid-liquid extraction. Effects of operating variables.

7549* (French.) Using Ion-Exchange Resins in Concentrating and Purifying Plutonium. **Utilisation des résines échangeuses d'ions pour la concentration et la purification du plutonium.** Isabelle Prévot and Pierre Regnaut. *Énergie Nucléaire*, v. 1, no. 4, Oct.-Dec. 1957, p. 207-215.

Properties of cation and anion resins; fixation, elution, and washing. Describes a process using C 50 resin with no recycling, precipitation, or centrifuging of active solutions and with easy elutions.

7550* (Russian.) Investigation of Some Regularities of Jigging Process by Means of Gamma Tracer. **Issledovanie nekotorykh zakonomernostei protsessa otsadki metodom gammalokatsii.** I. M. Verkhovskii, V. D. Zemskov, N. N. Vinogradov, and O. M. Arutinov. *Gornyi Zhurnal*, 1958, no. 1, Jan., p. 53-56.

New method permitting continuous registration of three-dimensional movement of tested particles by introduction of radioactive isotope can be applied to grain movement in various beneficiation processes. Basic block-diagram of this investigation, and apparatus consisting of a system of indicators, electronic calculator, loop oscillograph (recording device), high-voltage regulated rectifier, and voltage regulator.

7551 Updraft Pelletizing of Specular-Hematite Concentrates. Donald C. Violetta. *Journal of Metals*, v. 10, Feb. 1958, p. 118-121.

7552 The Lurgi Pelletizing Process: A Combined Updraft-Downdraft Technique. Kurt J. E. Meyer and Hans Rausch. *Journal of Metals*, v. 10, Feb. 1958, p. 129-133.

Addition of binders for improving the quality of the green pellets and addition of materials for increasing the ultimate strength are not necessary in this method.

7553 Sulfate Roasting Copper-Cobalt Sulfide Concentrates. L. F. Theys and L. V. Lee. *Journal of Metals*, v. 10, Feb. 1958, p. 134-136.

Story of the successful application of fluidized bed technique to a series of reactions taking place within narrow ranges of operating conditions, and of the transition to full-scale operation.

7554* (Hungarian.) Extraction of Uranium From Uranium-Ore Concentrates, Expansion of Problem to Hungarian Conditions. **Az urán kinyerése uránére koncentrátumokból, a probléma kiterjesztése hazai viszonylatra.** Gyula Almássy. *Magyar Kémikusok Lapja*, v. 12, no. 1, Jan. 1957, p. 23-27.

A review. Adaptation of precipitation process to coal ash with traces of U_3O_8. Outline of laboratory methods.

7555 The Adaptation of New Research Techniques to Mineral Engineering Problems. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission)*, NYO-4871, Oct. 1957, 36 p. (UF767 U3ny Contin.)

Progress report on research in flotation, surface chemistry, solvent extraction, comminution, thickening and thickeners, and electrostatic separation of minerals.

7556 Convertol Process. A. H. Brisse and W. L. McMorris, Jr. *Mining Engineering*, v. 10; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 211, Feb. 1958, p. 258-261.

Droplets of dispersed oil are brought into intimate contact with the solids suspended in the coal slurry. This causes oil to displace the water on the coal by preferential wetting, or phase inversion, after which the coal particles agglomerate to permit their removal by centrifugal filtration.

7557* Flotation: The Art of Utilizing Modifying Agents. Samuel P. Moyer. *Mining Magazine*, v. 98, Jan. 1958, p. 9-16.

Tools available to present day mineral-dressing engineers.

7558* Holly Minerals' New Three-Step Process for Impure Mercury Ores. Ernest Oberbillig, James Fyfe, William Aitkenhead, and John Jaekel. *Mining World*, v. 20, Feb. 1958, p. 53-56.

Process consists of three operations: crushing, grinding, and flotation concentration; leaching concentrates with Na_2S to produce the water-soluble double salt, $HgS \cdot Na_2S$; and electrolytic precipitation of the Hg from the alkaline sulfide solution.

7559 NH_4F—Versatile Reagent for Zirconium Fuels. A. T. McCord and D. R. Spink. *Nucleonics*, v. 16, Feb. 1958, p. 94 + 5 pages.

Ammonium fluoride usefulness for the dissolution and treatment of Zr and its alloys and its separation from U and the fission products. Used in the neutral and even acidic states, it would be far easier to handle and probably more economic than currently used reagents.

7560* (French.) Selective or Differential Size Reduction? **Broyage sélectif ou broyage différentiel?** E. C. Blanc. *Revue de l'Industrie Minérale*, v. 39, no. 12, Dec. 1957, p. 1083-1089.

Definition and comparison of both methods. Applications to the crushing of structurally homogeneous or heterogeneous rocks. "Positive" and "differential" crushers.

7561* (Polish.) The Optimum Separation of Concentrated Material Into Concentrate, Middlings and Tailings. **Optymalny podział wzbogacanego materiału na koncentrat, produkt przejściowy i odpady.** Wiktor Pudło. *Rudy i Metale Nieżelazne*, v. 2, no. 3, July-Sept. 1957, p. 65-69.

Using the bending point of the λ curve as a criterion of separation is defective for middlings and tailings. The points of separation must be determined by means of tangents parallel to the secants.

See also: **7444** (extraction of Pu)

PHYSICS

7562 Radiation Force on Bodies in a Sound Field. Haakon Olsen, Werner Romberg, and Harald Wergeland. *Acoustical Society of America, Journal*, v. 30, Jan. 1958, p. 69-76.

A simple derivation of the force which acts on a body placed in sound field is given. The tensor properties of the force are exhibited, but it is also shown that for a rigid body the force may be derived from the scalar pressure alone.

7563* (German.) Photostimulated Electron Phenomena in Colored NaCl Crystals. **Photostimulierte Elektronenerscheinungen bei verfärbten NaCl-Kristallen.** A. Bohun. *Acta Physica Academiae Scientiarum Hungaricae*, v. 8, nos. 1-2, 1957, p. 65-73.

Investigates such physical phenomena as thermoemission with thermoluminiscence, photoemission, and absorption in NaCl exposed to X-rays, especially with a stoichiometric excess of chlorine.

7564* (English.) **On Nuclear Magnetic Resonance in Flowing Liquid.** A. Z. Hrynkiewicz and T. Waluga. *Acta Physica Polonica*, v. 16, no. 5, 1957, p. 381-388.

The dependence of the amplitude of the absorption lines on the rate of flow was investigated. The flowing liquid method allows a simultaneous determination of the saturation factor and the longitudinal relaxation time.

7565 Negative Resistance. R. Stuart Mackay. *American Journal of Physics*, v. 26, Feb. 1958, p. 60-69.

Relaxation oscillations and other discontinuous phenomena in nature are considered in terms of the regenerative feedback needed for their appearance.

7566 Angular Momentum in Quantum Mechanics. A. R. Edmonds. 146 p. 1957. Princeton University Press, Princeton, N. J. (QC174 Ed57a)

A detailed development of the uses of the principle of conservation of angular momentum in the analysis of physical systems.

7567 (French.) Measurement of Damping in Plastic or Fibrous Materials. **Les mesures d'amortissement dans les matériaux plastiques ou fibreux.** Pierre Liénard. *Annales des Télécommunications*, v. 12, no. 10, Oct. 1957, p. 359-366.

Noise reduction in the walls of an airplane fuselage. Theory of the simple oscillator and calculation of the vibration curve of a steel bar. Elasticity modulus, linear or non-linear friction coefficients of steel and covering material. Cyclic losses of energy.

7568* The Theory of the Anomalous Skin Effect in Metals for Obliquely Incident Radiation. J. G. Collins. *Applied Scientific Research*, v. 7, sec. B, no. 1, 1958, p. 1-40.

At upper visible and ultra-violet frequencies, the effective surface impedance of a metal varies with the direction of polarization of the incident radiation. Expressions are obtained for the optical constants which are valid for all angles of incidence and for frequencies not lying within internal photoelectric absorption bands.

7569* (English.) **The Spectral Distribution of Oxygen-Filled Photolysis Flash Lamps as Determined by Chemical Actinometry.** Stig Claesson and Gunnar Wettermark. *Arkiv för Kemi*, v. 11, no. 6, 1957, p. 561-565.

Determines the spectral intensity distribution for lamps by means of chemical actinometry using a series of suitable filters, rather than by spectrographic methods.

7570 The Viscosity of Five Gases. A Re-Evaluation. J. Kestin and H. E. Wang. *ASME, Transactions*, v. 80, Jan. 1958, p. 11-17.

The data now reported contain an uncertainty of no more than 0.2% for N, air, H, and He and of not more than 0.6% for Ar with respect to N.

7571 A Model Method for Determining Geometric Factors in Solid-to-Solid Radiation Heat Transfer. P. L. Tea, Jr. and H. D. Baker. *ASME, Transactions*, v. 80, Feb. 1958, p. 367-372.

7572* A Method of Heating Matter of Low Density to Temperatures in the Range 10^5 to 10^6 °K. F. B. Knox. *Australian Journal of Physics*, v. 10, Dec. 1957, p. 565-586.

A method of confining fully ionized gases entirely by means of an oscillating electromagnetic field is described. The gas is heated by eddy currents induced in it by the oscillating field.

7573 Mass Spectrometric Analysis of Some Hydrogen Oxides. I. Larkin Kerwin and Maurice Cottin. *Canadian Journal of Physics*, v. 36, Feb. 1958, p. 184-191.

Typical mass spectrograms for H_2O, D_2O, H_2O_2, and D_2O_2. Both positive and negative ions were observed. Variations of the abundances of the spectrogram components with pressure.

7574 High Resolution Raman Spectroscopy of Gases. XI. Spectra of CS_2 and CO_2. B. P. Stoicheff. *Canadian Journal of Physics*, v. 36, Feb. 1958, p. 218-230 + 1 plate.

The vibrational Raman spectra of CS_2, $C^{12}O_2$, and $C^{13}O_2$, consisting of the strong Fermi diad v_1, $^2v_2$, were photographed with a 21-ft. grating.

7575* (French.) Magnetic Asymmetric Electronic Lenses. **Les lentilles électroniques magnétiques dissymétriques.** Pierre Durandeau, Charles Fert, and Paul Tardieu. *Comptes Rendus*, v. 246, no. 1, Jan. 6, 1958, p. 79-81.

The paraxial properties of the lenses were represented by the reference excitation corresponding to the least focal distance of the projector and by the least focal distance film as reference length.

7576* (French.) Electric and Magnetic Spectra of the γ-Fe_2O_3 Oxides. **Sur les spectres électrique et magnétique des oxydes Fe_2O_3 γ.** Jean-Claude Bluet, Israël Epelboin, and Denis Quivy. *Comptes Rendus*, v. 246, no. 2, Jan. 13, 1958, p. 246-249.

Measurements of complex permittivity at various frequencies of γ-Fe_2O_3 from 10 kHz to 23 GHz.

7577* (French.) Energy Spectrum of an Electron Beam After Penetrating a Thin Metallic Film. **Spectre d'énergie d'un faisceau d'électrons ayant traversé un film métallique mince.** Charles Fert and Ferdinand Pradal. *Comptes Rendus*, v. 246, no. 2, Jan. 13, 1958, p. 252-255.

Study of Al, Cr, Bi, Au, Ag, and Cu films. For the first three metals, the losses of energy were multiple integers of an elementary loss that was apparently explained by the theory of collective oscillations.

7578* (French.) Stable Excited States of Rotating Relativistic Fluid Masses. **États excités stables des masses fluides relativistes en rotation.** Pierre Hillion and Jean-Pierre Vigier. *Comptes Rendus*, v. 246, no. 3, Jan. 20, 1958, p. 394-396.

The center of mass and the center of matter must be used to describe the total motion of rotating fluid masses. This leads to stable, periodical, internally excited levels giving a possible concrete representation of the spectrum of the elementary particles.

7579 The Detection and Measurement of Infra-Red Radiation. R. A. Smith, F. E. Jones, and R. P. Chasmar. 458 p. 1957. Oxford University Press, London. (QC338 Sm64d)

Properties and limitations of thermal detectors such as thermopiles and bolometers; photo-detectors; random fluctuations limiting detector sensitivity; infra-red spectrometers and optical materials.

7580 (Russian.) On the Uniqueness of the Solution of Stephan's One-Dimensional Problem for a Heat Conducting Medium in One-Phase Initial State. **K voprosu ob edinstvennosti resheniia odnomernoi zadachi Stefana v sluchae odnofaznogo nachalnogo sostoianiia teploprovodiashchei sredy.** L. I. Rubinshtein. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 387-390.

7581 (Russian.) The Efficiency of Action of Some Fluorescence Quenchers as Related to the Position of the Fluorescence Spectrum. **O sviazi effektivnosti deistviia nekotorykh tushitelei fluorestsentii s polozheniem spektra fluorestsentii.** V. V. Zelinskii, V. P. Kolobkov, and N. I. Kondaraki. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 391-394.

Study of quenchers: triethylamine iodine, KI, aniline, and diethylaniline on the duration of fluorescence of 3-, 4-, and 3,6-derivatives of the phthalimide in water, acetone, methyl-, ethyl-, and butyl alcohol, ethyl acetate, pyridine, anisole, benzene, chlorobenzene, and N-octane.

7582 The Fundamental Constants of Physics. E. Richard Cohen, Kenneth M. Crowe, and Jesse W. M. Dumond. v. I. 287 p. 1957. Interscience Publishers, Inc., New York. (QC100.5 C66f)

Arbitrarily defined units and standards; classical measured constants and units; masses of atoms and mesons; history of atomic constants; post-war high-precision measurements; method of least squares; least-square adjustment of atomic constants.

7583* Measurement and Specification of Color Rendition Properties of Light Sources. Dorothy Nickerson. *Illuminating Engineering*, v. 53, Feb. 1958, p. 77-90.

7584 Calculation of Atomic Valence State Energies. Audrey L. Companion and Frank O. Ellison. *Journal of Chemical Physics*, v. 28, Jan. 1958, p. 1-8.

Given a molecular valence-bond wave function, the general theory is presented for calculating either the energy following complete *nonadiabatic* dissociation of the atoms or the intra-atomic energy of the molecule for equilibrium positions of the nuclei.

7585 Photon Impact Studies of Molecules Using a Mass Spectrometer. H. Hurzeler, Mark G. Inghram, and J. D. Morrison. *Journal of Chemical Physics*, v. 28, Jan. 1958, p. 76-82.

A vacuum ultra-violet monochromator was combined with a mass spectrometer, to study photoionization processes.

7586 Configuration Interaction Study of the Electronic Structure of the OH Radical by the Atomic and Molecular Orbital Methods. A. J. Freeman. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 230-243.

The role played in configuration interaction calculations by the particular form of the orbitals selected as basis is explored by a direct application on the electronic structure of the ground state of the OH molecule. Two configuration interaction studies were carried out using different sets of one-particle functions: the set natural to the isolated atoms and the orbitals belonging to the molecule.

7587 Theory of Separated Electron Pairs. Joe M. Parks and Robert G. Parr. *Journal of Chemical Physics*, v. 28, Feb. 1958, p. 335-345.

It is shown that the electronic energy of a system of separated electron pairs may be written in a particularly simple form, and the problem of determining the best separated electron-pair description of a particular molecule is discussed.

7588* A Remark on the Analogy Between Thermoelasticity and the Elasticity of Saturated Porous Media. J. Geertsma. *Journal of the Mechanics and Physics of Solids*, v. 6, no. 1, 1957, p. 13-16.

The analogous behavior of the temperature distribution in thermoelastic problems and the liquid pressure distribution in a saturated porous medium is worked out in detail and applied to plane strain and stress.

7589* (French.) Diffusion of Gases in the Vicinity of a Bubble of "Cavitation". **Diffusion des gaz au voisinage d'une bulle de cavitation.** P. Suquet. *Journal de Physique et le Radium*, v. 18, no. 12, Dec. 1957, p. 676-680.

Study of the diffusion of gases towards the liquid phase during the period of contraction of an ultrasonic bubble. The period of the vibratory motion is short enough for the geometric center of the bubble to be considered as motionless with respect to an axial system related to the container.

7590* (French.) Raman Lines Intensity of C-H Bonds as a Function of Conjugation. **Intensité des raies Raman des liaisons C-H en fonction de la conjugaison.** Monique Harrand and Claude Bazin. *Journal de Physique et la Radium*, v. 18, no. 12, Dec. 1957, p. 687-690.

Measuring and comparing the intensities of Raman lines for several compounds with and without unsaturated bonds. Intense lines in the range of 0-1800 cm^{-1} for molecules with multiple conjugated bonds. The lines of C-H bonds in a similar case are weak, possibly due to π electrons.

7591* (French.) Simple Apparatus for the Measurement of the Emission of Luminescent Powders, Excitable by Ultra-Violet. **Dispositif simple pour la mesure de l'émission des poudres luminescentes excitables en ultra-violet.** Maurice Legrand, André Lacam, and Marc Grosjean. *Journal de Physique et le Radium (Suppl.)*, v. 18, no. 12, Dec. 1957, p. 131A-134A.

Measurement of the spectral energy distribution, between 2000 and 8000 Å, of the light emitted by phosphors; drawing diffuse reflection curves for the same wavelength region. Adaptation of the apparatus on Beckman D.U. spectrophotometers.

7592 A New Electronic Method for Measuring Ultrasonic Velocities in Liquids. B. Ramachandra Rao and K. Subba Rao. *Journal of Scientific & Industrial Research*, v. 16, sec. B, Nov. 1957, p. 483-486.

Method is based on the determination of resonance positions of a sound wave in a finite length of liquid column.

7593* (English.) **Microwave Apparatus for the Measurement of the Refraction, Dispersion and Absorption of Gases at Relatively High Pressure.** A. Battaglia, F. Bruin, and A. Gozzini. *Nuovo Cimento*, v. 7, ser. 10, no. 1, Jan. 1958, p. 1-9.

Highly sensitive apparatus uses single frequency modulated klystron oscillator. Resonance curve of sample cavity is compared to one of reference cavity by means of an electronic device using μsec. pulse technique.

7594 Infrared Reflectance of Evaporated Metal Films. David M. Gates, Clyde C. Shaw, and Donald Beaumont. *Optical Society of America, Journal*, v. 48, Feb. 1958, p. 88-89.

A high-precision reflectance measurement method. Results for Al and Ag as a function of wavelength (visible to 13μ) and angle of incidence (20 to 60°).

7595 (English.) **Some Investigations on Arc Discharges in Helium and Hydrogen at High Pressures.** A. Michels, H. Tjin A Djie, H. De Kluiver, and C. A. Ten Seldam. *Physica*, v. 23, no. 12, Dec. 1957, p. 1115-1125.

For He the current, voltage across the arc, and its diameter were measured as a function of pressure. From these data the temperature in the positive column was calculated. For H, preliminary work also yielded an estimate of the temperature.

7596 Loss of Exchange Coupling in the Surface Layers of Ferromagnetic Particles. F. E. Luborsky. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 40-42.

Experiments with spherical Fe particles 28 A to 265 A in diameter demonstrate that the proposed nonferromagnetic surface layer on an Fe particle must be less than 1 A thick.

7597 Single-Crystal Orientation Effects in *K* X-Ray Absorption Spectra of Ge. Jassim M. El-Hussaini and S. T. Stephenson. *Physical Review*, v. 109, ser. 2, Jan. 1, 1958, p. 51-54.

A careful comparison of the absorption of a single crystal of Ge and a single crystal of an alloy of 7% Si in Ge has been made to 60 e.v. from the Ge *K*-edge. Significant changes in the structure were noted as well as a probable shift in the position of the edge.

7598 Band Structure of Graphite. J. C. Slonczewski and P. R. Weiss. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 272-279.

Tight-binding calculations, using a two-dimensional model of the graphite lattice, lead to a point of contact of valence and conduction bands at the corner of the reduced Brillouin zone.

7599 Solid-State Maser Amplifier. Alan L. McWhorter and James W. Meyer. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 312-318.

Operation at 800 Mc/sec. A dual-frequency cavity containing paramagnetic potassium chromicyanide in an isomorphous Co diluent is used at 1.25 K.

7600 Relaxation Time Anisotropy in *n*-Type Germanium. Colman Goldberg. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 331-335.

7601 Separation and Identification of Overlapping Hyperfine Structure Components: Application to Mercury Resonance Radiation. Paul L. Sagalyn, Adrian C. Melissinos, and Francis Bitter. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 375-380.

7602 Hyperfine Structure Measurements on Plutonium-239. J. C. Hubbs, R. Marrus, W. A. Nierenberg, and J. L. Worcester. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 390-398.

7603 Quantum Limitations of the Measurement of Space-Time Distances. H. Salecker and E. P. Wigner. *Physical Review*, v. 109, ser. 2, Jan. 15, 1958, p. 571-577.

Deals with the limitations which the quantized nature of microscopic systems imposes on the possibility of measuring distances between space-time events. It is proposed to use only clocks for measuring space-time distances and to avoid the use of measuring rods which are essentially macrophysical objects.

7604 Energy Exchange Between Electron and Ion Gases Through Coulomb Collisions in Plasmas. A. A. Dougal and L. Goldstein. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 615-624.

Experiments were performed to determine the time required for electron temperature deviations from equilibrium to return to equilibrium with the ion and molecule temperature. The method of guided micro-wave interaction within the plasma was employed for selectively heating the electron gas to increments above that of the ion and gas temperatures, and for sensing the subsequent electron temperature deviations through the electrical conductivity of the plasma. In addition, phototube detection of the plasma luminous intensity is employed to detect electron temperature deviations.

7605 Cross Quenching of Fluorescence in Organic Solutions. M. Furst and H. Kallmann. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 646-651.

Concentration quenching of different structure if their energy levels are close to each other. Equations are given for testing its occurrence.

7606 De-Excitation of ZnS and ZnCdS Phosphors by Electric Fields. Hartmut Kallmann, Bernard Kramer, and Peter Mark. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 721-729.

The change of impedance (photoconductivity) of certain ZnS and ZnCdS powder phosphor samples brought about by external a.c. (60 c.p.s.) and d.c. fields (up to 15,000 v./cm.), applied both during and after excitation with ultra-violet light (3660 A), is described and compared with impedance changes due to irradiation with infra-red light.

7607 Electron Interaction in Solids. General Formulation. Philippe Nozières and David Pines. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 741-761.

A general Hamiltonian formalism is developed to treat from first principles the motion of electrons in solids, including their

mutual Coulomb interaction. By a series of canonical transformations it is shown that under suitable circumstances (which obtain in nearly all solids) plasmons (a quantized collective plasma oscillation of the electron gas) represent a well-defined elementary excitation of the solid. The "existence criterion" for plasmons is found to be a high electronic polarizability.

7608 Electron Interaction in Solids. Collective Approach to the Dielectric Constant. Philippe Nozières and David Pines. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 762-777.

A quantum theory of the dielectric constant for solids of both low and high polarizability is developed from first principles. Both the static and frequency-dependent dielectric constants are derived.

7609 Mass-Energy Relation in Quantum Theory. W. F. G. Swann. *Physical Review*, v. 109, ser. 2, Feb. 1, 1958, p. 998-1008.

7610* Quantum Statistics of Interacting Particles: General Theory and Some Remarks on Properties of an Electron Gas. Elliott W. Montroll and John C. Ward. *Physics of Fluids*, v. 1, no. 1, Jan.-Feb. 1958, p. 55-72.

Gives a self-contained theory of the grand partition function of quantized systems of interacting particles.

7611 (French.) The Propagation of Waves in Corpuscular Media. **Propagation des ondes dans les milieux périodiques.** Léon Brillouin and Maurice Parodi. 347 p. 1956. Masson et Cie, Paris. (QC661 B76p)

A text-book on wave propagation. Historical survey on elastic waves in a one-dimensional network. Qualitative discussion. Mathematical study of networks made of identical particles. or of more complex networks. Propagation velocity, flow of energy characteristic impedance. Two and three-dimension networks. Mathieu equation. Slow waves.

7612 An Investigation of Droplet Oscillation During Mass Transfer. I. The Conditions Necessary, and the Source of the Energy for the Oscillations. D. A. Haydon. **II. A Dynamical Investigation of Oscillating Spherical Droplets.** T. V. Davies and D. A. Haydon. *Royal Society, Proceedings*, v. 243, ser. A, Feb. 11, 1958, p. 483-499.

The violent and erratic motion often exhibited by pendent drops during diffusion of a solute across their interfaces was investigated qualitatively and quantitatively. A mechanism is proposed to account for transient non-uniformity of interfacial tension during diffusion. Equations of motion for the oscillation of a liquid drop pendent in another liquid are derived. The predicted frequencies of oscillation for a number of systems having different physical properties (viscosity, density, drop radius, etc.) were found in good agreement with experiment.

7613 The Absorption of Sound in Liquid Helium II. K. Dransfeld, J. A. Newell, and J. Wilks. *Royal Society, Proceedings*, v. 243, ser. A, Feb. 11, 1958, p. 500-517.

The absorption was measured in the temperature range down to 0.4 K, at frequencies of 6.0 and 14.4 Mc., and under pressures up to 25 atm.

7614* Magnetism in Materials. II. Ferromagnetic Domains and Their Influence on Magnetic Properties. D. H. Martin. *Wireless World*, v. 64, Feb. 1958, p. 70-74.

(To be continued.)

7615 Measurements of the Viscosity of Gas Mixtures. William A. Strauss and Rudolph Edse. *Wright Air Development Center, WADC Technical Report* 57-484, Aug. 1957, 15 p. (TL507 Un3.18w Vis.)

The dynamic viscosities of methane-air, methane-oxygen, and hydrogen-nitric oxide gas mixtures were measured in a capillary viscosimeter.

7616* (German.) A Method for the Measurement of Heat Conductivity at 1100° C. **Eine Messmethode für die Ermittlung des Wärmeleitvermögens bei 1100°C.** Kl. Schäfer and F. W. Reiter. *Zeitschrift für Elektrochemie*, v. 61, no. 9, 1957, p. 1230-1235.

Description of an apparatus for the determination of the thermal conductivity of gases, allowing measurements up to 1100 C. Corrections for radiation and terminal leakage. Limited convection with higher temperatures in gases having excellent conductivity.

7617* (German.) Photo-Optical Diffraction Tests on Paracrystalline Model Structures. **Lichtoptische Beugungsversuche an parakristallinen Modellstrukturen.** Richard Bonart. *Zeitschrift für Kristallographie*, v. 109, nos. 4-6, Dec. 1957, p. 309-337.

Two-dimensional lattices of a liquid-type disorder were investigated. Visible-light diffraction experiments (Fraunhofer type) reveal the influence of the four oscillation parameters (in three-dimensional lattices nine such parameters occur) upon the shape of the reflections.

7618* (German.) The Improvement of the Evaluation Processes for the Exact Determination of the Lattice Constants of Cubic Crystals According to the Powder Method. **Verfeinerung der Auswerteverfahren für die Präzisionsbestimmung von Gitterkonstanten kubischer Kristalle nach der Pulvermethode.** Hermann Weyerer. *Zeitschrift für Kristallographie*, v. 109, nos. 4-6, Dec. 1957, p. 338-353.

A method for the accurate evaluation of powder photographs of cubic substances based upon the Gauss correlation theorem. Equally good results can be obtained by means of improved graphical extrapolation methods which are even more convenient to handle.

7619* (German.) Extrapolation Methods for Powder Diagrams of Non-Cubic Crystals. **Extrapolationsmethoden für Pulverraufnahmen von nichtkubischen Kristallen.** Hermann Weverer. *Zeitschrift für Kristallographie*, v. 109, nos. 4-6, Dec. 1957, p. 354-366.

A graphical extrapolation method for the evaluation of non-cubic powder diagrams. Essential point of new method is that each lattice parameter is determined from only those reflections for which the influence of the other parameters is very small.

7620* (German.) The Upper Curie Point and Domain Structure in Various Regions of Rochelle-Salt Crystals. **Obere Curie-Temperatur und Domänenstruktur in verschiedenen Gebieten von Seignettesalz-Kristallen.** Horst E. Müser and Horst Flunkert. *Zeitschrift für Physik*, v. 150, no. 1, 1958, p. 21-32.

A study of crystals formed during cooling of saturated Rochelle salt solution, revealed that their outer most part has b-domain structure, and the rest only c-domain structure. The Curie point of the b-domain structure is 0.47 ± 0.05 C higher than the c-domain.

7621* (German.) Temperature Dependence of the Optical Constants of LiF and NaF Under Infra-Red Radiation. **Die Temperaturabhängigkeit der optischen Konstanten von Lithiumfluorid und Natriumfluorid im Ultraroten.** Manfred Klier. *Zeitschrift für Physik*, v. 150, no. 1, 1958, p. 49-63.

Temperature dependence of the total-reflection coefficient and the reflecting power of LiF and NaF was studied in the range from −196 to +300 C.

7622* (English.) **The Effect of Grinding on the Structure and Luminescence of Zinc and Zinc-Cadmium Sulphides.** M. A. Short and E. G. Steward. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 13, nos. 5-6, Dec. 1957, p. 298-315.

On grinding ZnS-Ag, the photoluminescence brightness of the hexagonal form was found to drop more rapidly than that of the cubic form. This and changes in color are discussed in terms of the inversion towards a cubic structure which occurs when the hexagonal sulfides are ground.

See also: **6199** (plasma jet research); **6862** (advances in electroluminescence); **6881** (optical absorption in Ge-Si alloys); **6918** (conductive fluid flow past magnetized bodies).

PLASTICS

7623* Polyvinyl Chloride Resins. II. P.V.C. Paste Resins (Paste Formulation). M. S. Welling. *Adhesives & Resins*, v. 5, Oct. 1957, p. 116 + 6 pages.

7624* (German.) Composition of Hardened Polyester Resins. **Über die Zusammensetzung gehärteter Polyesterharze.** W. Funke and K. Hamann. *Angewandte Chemie*, v. 70, no. 2, Jan. 21, 1958, p. 53.

Hardening methods and conditions. Comparison of the molar composition of polyester resins from styrol and fumaric acids by means of (O content). Relationship between the molar composition of hardened polyester resins and the molar composition of polymers of hydrolysis products.

7625* (German.) The Mechanism of Polymerization of Amino Acid-N-Carboxylic Acid Anhydrides. Investigations of the Isotope Effect. **Zum Mechanismus der Polymerisation von Aminosäure-N-Carbonsäureanhydriden. Untersuchungen zum Isotopie-Effekt. II-III.** Kurt Keyns, Hans Schultze, and Rolf Brockmann. *Annalen der Chemie*, v. 611, nos. 1-3, 1958, p. 33-57.

7626 Block and Graft Polymers. I. Graft Polymers From Acrylamide and Acrylonitrile. II. Block Polymers From Acrylamide and Acrylonitrile and Acrylamide and Acrylic Acid. M. L. Miller. *Canadian Journal of Chemistry*, v. 36, Feb. 1958, p. 303-314.

Graft polymers were prepared by chain transfer to polymer and by photolysis and a copolymer containing a few per cent of α-chloroacrylonitrile. Block polymers were prepared by photolysis of polymers with end groups that contained Br.

7627 Azonitriles as Initiators for Polymerization of Methyl Methacrylate. N. G. Saha, U. S. Nandi, and Santi R. Palit. *Chemical Society, Journal*, 1958, Jan., p. 7-12.

The polymerization of methyl methacrylate, both homogeneously and in toluene and ethyl acetate, was initiated with six azonitriles at 60 C.

7628 The Effect of Temperature on Azonitriles as Initiators in the Polymerization of Styrene. N. G. Saha, U. S. Nandi, and Santi R. Palit. *Chemical Society, Journal*, 1958, Jan., p. 12-16.

Kinetic constants of the polymerization were studied from 30 to 117 C.

7629* (German.) Lanon, a Polyester Fiber From Schwarza. **Lanon, eine Polyesterfaser aus Schwarza.** Hermann Ludewig. *Chemische Technik*, v. 9, no. 12, Dec. 1957, p. 693-696.

Air, water, NaCl, coal, or petroleum are raw material for production of Lanon. Properties and use of these new synthetic fibers. Comparison with nylon, Perlon, and Trenon.

7630* (German.) Development and Use of Organic Glass. **Entwicklung und Verwendung des organischen Glases.** Arthur Lehmann. *Chemische Technik*, v. 9, no. 12, Dec. 1957, p. 696-697.

Synthesis of methacrylic acid methylester. Polymerization and the polymers; their properties and application.

7631* (German.) Investigation of the Cationic Polymerization of Conjugated Diolefins. **Untersuchungen zur kationischen Polymerisation konjugierter Diolefine.** Franz Runge and Rudolf Aust. *Chemische Technik*, v. 9, no. 12, Dec. 1957, p. 701-704.

Use of the metal halide-hydrogen halide-ether catalyst system by means of which conversion of diolefins to low molecular polymers at temperatures below zero C and normal pressure was studied.

7632* (Italian.) Influence of Crystallinity and of Crosslinks on the Elastic and Anelastic Behavior of High Polymers. **Influenza della cristallinità e dei legami trasversali sul comportamento elastico ed anelastico degli alti polimeri.** M. Baccaredda and E. Butta. *Chimica e l'Industria*, v. 40, no. 1, Jan. 1958, p. 6-13.

Dynamic mechanical properties of some high polymers of different structure are determined over a range from −70 to 250 C and in a frequency range from 2 to 30 kc. The transitions due to structural changes are determined by the singular points of the curves of the sound velocity and of the damping factor as functions of temperature.

7633* (Russian.) A Comparative Study of the Ordering Arising in Polymers on Their Crystallization or Orientation of Chain Molecules. **Sravnitelnoe issledovanie uporiadochennosti, voznikaiushchei v polimerakh pri ikh kristallizatsii ili orientatsii tsepnykh molekul.** V. A. Kargin and G. S. Markova. *Doklady Akademii Nauk SSSR*, v. 117, no. 3, Nov. 21, 1957, p. 427-429 + 1 plate.

Study on polyethylene and gutta-percha shows that ordering of the polymer molecule originates in the amorphous state of the polymer. This ordering is probably necessary for ensuing crystallization.

7634 Treeing Effects in Polyethylene. D. W. Kitchin and O. S. Pratt. *Electrical Engineering*, v. 77, Mar. 1958, p. 218-223.

"Trees", or microscopic channels extending partly or wholly through a wall of insulation, represent a characteristic form of latent damage. Results are given of studies made on this phase of dielectric breakdown in polyethylene.

7635* Engineering Applications of Rigid Foamed Plastics. A. Gilmour and C. B. Flindt. *Engineer*, v. 205, Feb. 7, 1958, p. 204-207.

Preparation and properties of foam; factors affecting density; application techniques; safety precautions.

7636 The Solubilities of Gases in Polyvinyl Acetate. P. Meares. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 40-46.

The solubility coefficients of He, Ne, and H were determined from 8 to 40 C by establishing equilibrium between polymer and gas phase and then desorbing the dissolved gas into a known large volume.

7637 A Method of Measuring the Heats of Polymerization. I. The Heat of Polymerization of Vinyl Acetate. W. I. Bengough. *Faraday Society, Transactions*, v. 54, Jan. 1958, p. 54-59.

Heat of reaction is obtained by equating the rate of rise of temperature under adiabatic conditions to the rate of reaction measured dilatometrically.

7638 Chemical Interactions in the Poly(vinyl Formal)-Phenolic Resin System. Saul M. Cohen, Robert E. Kass, and Edward Lavin. *Industrial and Engineering Chemistry*, v. 50, Feb. 1958, p. 229-232.

An initial study of effects of intermediate temperatures, acid catalyst, and antioxdants gives insight into the structure of cured poly(vinyl formal)-phenolic wire enamel structure.

7639* Some Thermal Aspects of Epoxy Resins. E. Klopfenstein and Henry Lee. *Insulation*, v. 4, Feb. 1958, p. 13-16.

Use of the dilatometer and heat distortion tester in practice.

7640* (Russian.) The Copolymerization of Divinyl With Vinyl Formate. **O sopolimerizatsii divinila s vinilformiatom.** S. N. Ushakov and S. S. Ivanov. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 12, Dec., p. 1465-1471.

7641* (Russian.) The Synthesis of Polyarylenalkyls. **Sintez poliarilenalkilov. I.** Polycondensation of Methylene Chloride With the Halogen Derivatives of Benzene. **Polikondensatsiia khloristogo metilena s galoidoproizvodnymi benzola.** G. S. Kolesnikov, V. V. Korshak, and T. V. Smirnova. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 12, Dec., p. 1478-1481.

The polycondensation of methylene chloride with fluorobenzene, chlorobenzene, and bromobenzene was studied.

7642* (Russian.) The Organomagnesium Synthesis of Vinyl Derivatives of Silicon, Germanium, and Lead. **Magniiorganicheskii sintez vinilproizvodnykh kremniia, germaniia i olova.** A. D. Petrov and V. F. Mironov. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, 1957, no. 12, Dec., p. 1491-1493.

The condensation of Norman's reagent (CH_2=CHMgBr) with chloralkylsilanes, germanes, and stannanes makes possible a high-yield synthesis of vinyl derivatives of these elements with any amount of vinyl radicals.

7643 Fracture Phenomena and Molecular Weight in Polymethyl Methacrylate. Sanford B. Newman and Irvin Wolock. *Journal of Applied Physics*, v. 29, Jan. 1958, p. 49-52.

7644 Catalytic Graphite Inclusion Compounds. I. Potassium Graphite as a Polymerization Catalyst. H. Podall, W. E. Foster, and A. P. Giraitis. *Journal of Organic Chemistry*, v. 23, Jan. 1958, p. 82-85.

Potassium graphite, KC_8, catalyzes the polymerization of ethylene at low pressure. The effects of various reaction conditions, including concentration of catalyst, catalyst support, and additives were studied.

7645 An X-Ray Study of Some Vinylidene Chloride-Acrylonitrile Copolymers. Alcuin F. Gremillion and Ernabelle Boulet. *Journal of Physical Chemistry*, v. 62, Jan. 1958, p. 94-96.

Membranes cast from solutions of the resins were studied and evidence shows that these polymers are ordered to a small extent.

7646* (German.) Conditions for Plastic Deformation in Welded PVC Sheetings. **Bedingungen plastischer Verformung beim Verschweissen von PVC-Folien.** H. Haldenwanger and W. Berger. *Kunststoffe*, v. 48, no. 1, Jan. 1958, p. 13-16.

Strength of the welded joints depends on the temperature, pressure, and time the pressure was exerted. Describes an instrument for determining the dependence of plastic deformation on these factors under given conditions.

7647* (German.) Flow Capacity and Wear Effect of Thermosetting Molding Batches. Resistance to Wear by Chromium Coated Steel. **Fliessvermögen und Verschleisswirkung härtbarer Formmassen. Verschleissbeständigkeit von Formstählen und einer Chromschicht.** A. Lundborg. *Kunststoffe*, v. 48, no. 1, Jan. 1958, p. 16-20.

Determination of life of a mold used for compression molding of thermosetting materials at various temperatures and pressures. Radioactive method for determination of wear. For three different types of steel, the resistance to wear varied in a ratio of 1:3; a coating of Cr increased the wear resistance three-fold.

7648 (Hungarian.) Synthetic Linear Polymers. **Szintétikus lineáris polimerek. II.** Viscometric Determination of the Molecular Weight of Superpolyamides in Aqueous Chloral Hydrate. **Szuperpoliamidok molekulasúlyának viszkozimetrikus meghatározása vizes khlorálhidrátban.** István Rusznák, Istvan Géczy, and Endre Ady. *Magyar Kémiai Folyóirat*, v. 63, no. 12, Dec. 1957, p. 348-350.

Replacing *m*-cresol by 70% aqueous chloral hydrate in determining the mol. wt. of polyamides. A balancing calculation of the relationship between the limit viscosity and the average polymerization value was obtained.

7649 (Hungarian.) Synthetic Polymers. **Szintétikus polimerek. IV.** Change of the Condensation Phenomenon and of the Mechanical Properties as a Function of the Composition of Phenoplast Cast Resin. **Fenoplaszt öntögyanták kondenzációjának és mechanikai tulajdonságának változása az összetétel függvényében.** Rudolf Balló and István Géczy. *Magyar Kémiai Folyóirat*, v. 63, no. 12, Dec. 1957, p. 351-357.

Impact strength, hardness, breaking tension in resin with more than 1:2 phenol-formaldehyde molar ratio are greater than in resin where the ratio is less.

7650 Polyethylene Film for Fruit. R. E. Hardenburg, H. A. Schomer, and M. Uota. *Modern Packaging*, v. 31, Feb. 1958, p. 135 + 9 pages.

Current uses and knowledge of polyethylene box liners and protective covers for wholesale units of fruit; applications of this film during cold storage of fruit and in transportation to market.

7651 How and Why to Use Glass-Reinforced Injection Molding Compounds. Rexford Bradt. *Modern Plastics*, v. 35, Mar. 1958, p. 100 + 4 pages.

Glass-fiber-filled materials feed and mold well in modern injection machines to produce rigid articles without trim or nonreusable waste and having outstanding physical properties, dimensional stability, and general ruggedness.

7652 Molding Shrinkage and Related Effects in a Fixed-Cavity Compression Mold. II. W. R. McGlone and L. B. Keller. *Modern Plastics*, v. 35, Mar. 1958, p. 117 + 5 pages.

Changes in molding conditions have little effect on the density of non-porous parts. Molding shrinkage factors can be determined with good precision, as illustrated by values for Diall 50-01.

7653 The Polyolefin Plastics Field—Present Technical Status. Frank C. McGrew. *Modern Plastics*, v. 35, Mar. 1958, p. 125 + 4 pages.

Reviews polyolefins and their properties.

7654 Thermoplastic Resins. *Paint Manufacture*, v. 28, Feb. 1958, p. 51 + 3 pages.

Published accounts of the chemistry, preparations, and applications of polyolefines, acrylics, polymers containing B, P, and F, and vinyl esters and ethers are reviewed and references made to patents and products relating to this subject.

7655* The Advantages of Using A-C Polyethylene 6S in Injection Molding. Karl F. Koch and Jack Peck. *Plastics Industry*, v. 16, Feb. 1958, p. 35 + 3 pages.

A-C Polyethylene 6S features good color dispersion and high gloss, shorter cycles, lower injection molding pressure, shrinkage control, and superior mold release.

7656 The Properties and Testing of Plastics Materials. A. E. Lever and J. Rhys. 197 p. 1958. Chemical Publishing Co., New York. (TA455.P7 L57p)

General principles; physical, thermal, optical, chemical, and electrical properties; identification and analysis; special tests and properties of industrial materials; testing of finished moldings; efficiency of plasticizers; standards.

7657* (French.) Polyethylene. **Le polyéthylène.** F. Barillet. *Revue Générale du Caoutchouc*, v. 34, no. 12, Dec. 1957, p. 1258-1259.

Differences between conventional polyethylene and Ziegler or Phillips grades, regarding mechanical properties and aging. New uses, processing methods, and a few applications.

7658* Friction and Abrasion Characteristics of Plastics Materials. M. A. Marcucci. *SPE Journal*, v. 14, Feb. 1958, p. 30-33.

Equipment and procedures used in determining the frictional properties of materials after extended periods of contact with metal riders at relatively high loadings and rates of speed.

7659* Heat-Blast Erosion Effects on Reinforced Plastic Laminates. N. B. Miller and E. L. Strauss. *SPE Journal*, v. 14, Feb. 1958, p. 37 + 4 pages.

Phenolic-glass, silicone resin-glass, and triallyl cyanurate polyester-glass fabric laminates and an asbestos-phenolic laminate were evaluated among other specimens varying in thickness from 10 to 60 mils.

7660* Polyethylene Films. C. J. B. Thor. *SPE Journal*, v. 14, Feb. 1958, p. 44-46.

Properties and uses.

7661* (Romanian.) Plastics Based on Furfural and Its Derivatives. **Mase plastice pe baza de furfurol si derivati. V.** The Effect of Thermal Treatment on the Behavior of Furfural-Phenol Resin in Water and Oil. **Influenta tratamentului termic asupra comportării fată de apă şi ulei a textolitului cu răşină furfurol-fenolică.** V. Calcan, I. Ionescu, and N. Goldenberg. *Studii şi Cercetări de Mecanică Aplicată*, v. 8, no. 3, 1957, p. 847-863.

7662* (Russian.) The Copolymerization of Vinyl Chloride and Acrylic Acid Esters. **Sovmestnaia polimerizatsiia khloristogo vinila s efirami akrilovoi kisloty.** G. V. Tkachenko, L. V. Stupen', P. Kofman, and L. Z. Frolova. *Zhurnal Fizicheskoi Khimii*, v. 31, no. 12, Dec. 1957, p. 2676-2681.

Copolymerization of vinyl chloride, methylacrylate, *n*-butylacrylate, and *n*-octylacrylate. From the composition the copolymerization constants were obtained.

See also: **6602** (polysiloxanes with mixed radicals); **6779** (plastics in electrical equipment); **6786** (electrical properties of epoxies); **7079** (nylon sleeve bearings); **7105** (thin wall plastics parts design); **7695** (permeability of plastic films to refrigerant 12 and nitrogen); **7727** (joining polyethylene).

POLLUTION AND WASTES

7663* Filtering Radioactive Particles From Stack Gas. H. E. Anderson. *Air Conditioning, Heating, and Ventilating*, v. 55, Feb. 1958, p. 71-77.

Various filtering devices are evaluated.

7664 Neutralization of Spent Pickle Liquor With Lime Sludge or Ground Lime Coupled With Production of Heat-Insulating Materials. V. A. Radtsig and T. L. Bruk-Levinson.

Henry Brutcher Translation No. 4061, 9 p. (From *Stal'*, v. 17, no. 9, 1957, p. 858-860.) Henry Brutcher, Altadena, Calif.

With small consumptions of acid for pickling metal the liquid phase in neutralization can be removed if lime sludge or dry ground lime is used instead of milk of lime. The resulting sediment can be pressed into heat-insulating materials.

7665* (Dutch.) Report on the Treatment of Retting Waste Water by Activated Sludge. **Verslag over de zuiveringsproeven van rootafvalwater bij middel van actieve slib.** L. Ghyssaert and L. Wauters. *Centre Belge d'Etude et de Documentation des Eaux, Bulletin (Trimestrielle)*, 1957, no. 38, p. 242-249.

Reduction of Fe to less than 0.5 mg/1. and considerable decrease of the production of volatile fatty acids. Three aeration methods were used: the rotating brush process, air-water mixing in "Dower-jets", and air injection.

7666 Design of a Regional Survey Program. J. Henry Horton, Jr. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-253, Nov. 1957, 20 p. (UF767 Un3.1dp Contin.)

Sources of radioactive waste. Sampling programs for airborne and waterborne radioactivity and radioactivity in biological specimens. Laboratory analyses of α, β, and γ radiation.

7667* Air Cleaning With Electrostatic Precipitators. B. K. R. Prasad. *Electrical Energy*, v. 2, Feb. 1958, p. 66-68.

Principle of system that uses voltages only of the order of 6 to 13 kv. and thus generates little ozone.

7668* Practical Application of Laboratory Data to Dairy Waste Treatment. Nandor Porges. *Food Technology*, v. 12, Feb. 1958, p. 78-80.

An aeration method for treating skim milk waste.

7669* (German.) Experimental Study of the Chlorination of Sewage. **Experimentelle Studien zur Abwasserchlorung.** Ludwig Popp. *Gas- und Wasserfach*, v. 99, Ausgabe Wasser, no. 4, Jan. 24, 1958, p. 73-77.

Description of the chlorination processes in respect to biological purification of sewage, as well as the chlorine dosage and the results are stated. Basic principles for the practical application of the process are given.

7670* Mist and Dust Collection Equipment. W. E. Ranz and C. Hofelt, Jr. *Industrial Wastes*, v. 3, Jan.-Feb. 1958, p. 1-6.

General methods; operation of common types of equipment.

7671* Treatment of Tannery Waste by Activated Sludge. Barnet L. Rosenthal. *Leather Manufacturer*, v. 75, Feb. 1958, p. 26 + 2 pages.

Where disposal of a primary treated tannery waste is a problem, pilot plant experiments on the specific waste should prove that activated sludge secondary treatment is feasible because of the high loadings that can be attained.

7672* Airborne Dust Determinations and a New Method of Particle Sizing. Howard L. Hartman. *Mines Magazine*, v. 48, Jan. 1958, p. 21 + 10 pages.

Dust sampling; composition analysis; quantitation; particle sizing; conversion of data from weight to number basis.

7673 Treatment and Disposal of Fuel-Reprocessing Waste. Joseph A. Lieberman. *Nucleonics*, v. 16, Feb. 1958, p. 82-89.

7674 Air Pollution Control. *Oil and Gas Journal*, v. 56, Feb. 17, 1958, p. 87-102.

National survey of how refiners are approaching the problem of waste control covers cost of pollution control, organization for control, what researchers are doing, and trends in legislation.

See also: **6814** (purification of dye-water).

RUBBER AND ELASTOMERS

7675* Rubber as a Corrosion Resistant Material. W. A. Heath. *Corrosion Prevention and Control*, v. 5, Jan. 1958, p. 49-55.

Application of different rubbers in corrosive environments.

7676* (Russian.) The Evaluation of the Dispersion of Carbon Black on the Basis of Electron-Microscopic Investigations. **Otsenka dispersnosti sazhi po dannym elektrouno-mikroskopicheskikh issoledovanii.** E. N. Bystrov. *Gazovaia Promyshlennost'*, 1957, no. 12, Dec., p. 20-26.

The distribution of carbon-black particles as to their size follows the logarithmic law. The dispersion β of the furnace black tested was found to range between 1.4 and 1.6; for certain thermal blacks it reaches the value 1.9.

7677* Some Special Characteristics of Modern Factice Types. C. Falconer Flint, C. B. Featherstone, and J. Donnelly. *Institution of the Rubber Industry, Transactions*, v. 33, Dec. 1957, p. 181-210.

Six typical factices covering a wide range of acetone extract values and free S contents were studied with respect to their influence on the processing, aging and vulcanizate properties of natural rubber mixings.

7678* Evaluation of Tyre Compounds by Means of Laboratory and Service Tests. E. R. Thornley. *Institution of the Rubber Industry, Transactions*, v. 33, Dec. 1957, p. 211-233.

Testing problems associated with the development of suitable casing compounds, the phenomenon of surface cracking in its various forms, and tread wear.

7679* Infrared Study of Some Structural Changes in Natural Rubber During Vulcanization. Frederic J. Linnig and James E. Stewart. *Journal of Research, National Bureau of Standards*, v. 60, Jan. 1958, p. 9-21.

7680* Some Thermodynamic Properties of the Systems Polybutadiene-Benzene and Polyisobutene-Benzene. R. S. Jessup. *Journal of Research, National Bureau of Standards*, v. 60, Jan. 1958, p. 47-53.

7681* (German.) Deformation Properties of Vulcanized Rubbers. **Verformungseigenschaften von Vulkanisaten.** P. Kainradl and F. Händler. *Kautschuk und Gummi*, v. 11, no. 1, Jan. 1958, p. 14WT-17WT.

Theoretical study of relationship between flow and dynamic properties. Various methods for measuring the relationship between the static and dynamic modulus of elasticity and the loss factor at 100-cycle compressive-load application.

7682* (English.) **Vinyl Polymerization. XXII. Determination of Length and Numbers of Grafted Branches of Polystyrene on Natural Rubber.** Yayoi Mori, Yuji Minoura, and Minoru Imoto. *Makromolekulare Chemie*, v. 25, nos. 1-2, 1957, p. 1-6.

By the consecutive oxidation of graft copolymer with perbenzoic acid and with periodic acid, the trunk of polyisoprene degraded completely into low molecular compounds, only the polystyrene branch remaining.

7683* (French.) Polygard Stabilized GR-S. **Les GR-S stabilisés au polygard.** B. Peters. *Revue Générale du Caoutchouc*, v. 34, no. 12, Dec. 1957, p. 1233-1246.

Protection of GR-S, without staining, against O and heat effects by means of Polygard. Better processing since the polymer is not resinified and no gel is produced. Fairly constant Mooney viscosity; higher final mechanical characteristics; good aging performance.

7684* (English.) **Changes in the Electrical Properties of Natural Rubber/Carbon Black Compounds During Pan-Vulcanization.** H. Desanges, R. Chasset, and P. Thirion. *Revue Générale du Caoutchouc*, v. 34, no. 12, Dec. 1957, p. 1260-1267.

Measuring the L.F. loss, dielectric constant, and conductivity, using the curing mold as an electrode. Evolution of electric properties from initial vulcanization when the compound is not yet cured. Determination of the effects of vulcanization and black colloid-structure.

7685 Radiation Curing of Silicone Rubber. L. M. Epstein and N. S. Marans. *Rubber Age*, v. 82, Feb. 1958, p. 825-830.

Sources of energy; chemical reactions of the polymer; advantages, including improved age resistance; modification of silicones.

7686 Thermal Diffusivity of Butyl Rubber and Its Compounds. I. Determination of Diffusivity Coefficients. Donald R. MacRae and R. L. Zapp. *Rubber Age*, v. 82, Feb. 1958, p. 831-837.

7687 Swelling Behavior of Rubbers Compounded With Reinforcing Pigments. B. B. S. T. Boonstra and Eli M. Dannenberg. *Rubber Age,* v. 82, Feb. 1958, p. 838-846.

Data for vulcanizates of natural rubber, butadiene-styrene copolymer 1500, butyl rubber, neoprene, and nitrile rubber containing fumed silica, precipitated silica, precipitated calcium metasilicate, hard clay, and carbon black in chloroform, benzene, hexane, and acetone.

7688* Frictional Temperature Rises on Rubber. A. Schallamach. *Rubber Chemistry and Technology,* v. 30, Oct.-Nov. 1957, p. 1097-1102.

Frictional temperature rises and frictional forces on rubber at velocities up to about 400 cm/sec. were determined by employing a thermojunction as slider.

7689* Organic Auxiliaries for Synthetic Rubber. W. McG. Morgan. *Rubber and Plastics Age,* v. 39, Jan. 1958, p. 37 + 6 pages.

Vulcanization accelerators; filler dispersion; antioxidants; white stocks with reinforcing properties; softeners.

7690* Mooney Viscosity as Related to Molded Electrical Products. A. A. Kessel. *Rubber World,* v. 137, Feb. 1958, p. 695 + 6 pages.

Mooney data was used to develop a method for determining optimum fill rate and molding temperature for injection molding of electrical apparatus with elastomeric materials.

7691* Vulcanization of Silicone Rubber. J. R. Harper, A. D. Chipman, and G. M. Konkle. *Rubber World,* v. 137, Feb. 1958, p. 711 + 6 pages.

A comparative evaluation of the most effective peroxide vulcanizing agents at the present time.

See also: **6446** (quantitative determination of rubber chemicals); **6447** (residual styrene in SBR latex); **6585** (nature of carbon black surfaces); **6586** (silicone rubbers); **6760** (tire cord treater).

SPACE HEATING AND CONDITIONING

7692* Trends in Air-Conditioning Use and Regulation. *American Water Works Association, Journal,* v. 50, Jan. 1958, p. 75-96.

7693 Heat Transfer Rates to Boiling Freon 114 in Vertical Tubes. H. L. Foltz. *Goodyear Atomic Corporation (U. S. Atomic Energy Commission),* GAT-222, Jan. 1958, 19 p. (UF767 Un3.1ga Contin.)

Heat transfer rates from condensing steam to boiling Freon 114 were measured in vertical tubes of ⅝-, ½-, and ¼-in. diameters to determine where the assumption of uniform heat flux could be safely used and how tube length, tube diameter, flow rates, pressure, and temperature difference affected uniformity.

7694* Refrigeration Controls. I. H. H. Egginton. *Modern Refrigeration,* v. 61, Jan. 1958, p. 51-55.

Principles of different types of control devices. (To be continued.)

7695* Permeability of Plastics Films to Refrigerant 12 and Nitrogen. H. M. Parmelee. *Refrigerating Engineering,* v. 66, Feb. 1958, p. 35 + 6 pages.

TEXTILES, FIBERS, LEATHER, AND PAPER

7696* (German.) Reactions of Ligin During Sulfating. Introduction of Sulfur Into Lignin. **Über die Reaktionen des Lignins bei der Sulfatkochung. Der Einbau des Schwefels in das Lignin.** Josef Gierer and Bo Alfredsson. *Acta Chemica Scandinavica,* v. 11, no. 9, 1957, p. 1516-1529.

Sulfidizing of lignin has been studied using model compounds of *p*-hydroxybenzyl alcohol, -benzylalkyl ether, and -dibenzyl ether types as well as isolated lignin preparations.

7697* Influence of Loading on the Rigidity Modulus and Plastic Flow of Wood. D. Narayanamurti, R. C. Gupta, and Venkatesh Narayanamurti. *Applied Scientific Research,* v. 7, sec. A, nos. 2-3, 1958, p. 145-148.

In this study of wood in the wet condition it was found that the increase of rigidity by loading was greater with sapwood than with heartwood and less with leached wood than with unleached wood.

7698* Suspension Drying of Sawdust. S. E. Corder. *Forest Products Journal,* v. 8, Jan. 1958, p. 5-10.

Suspension drying permits higher efficiency drying and requires less floor space. In the process, wet material is fed into a drying duct which contains hot gas. The gas conveys the particles up the duct, drying them in the process. Dryer capacity and efficiency decrease with the increase of particle size.

7699* (German.) The Properties of Leather From the Viewpoint of Science. **Die Eigenschaften des Leders vom Standpunkt der Wissenschaft.** W. Grassmann. *Leder,* v. 9, no. 1, Jan. 1958, p. 1-5.

The special properties of leather, which distinguish it from textiles, felts, and sheets of synthetic material, are ascribed to the growth structure of the skin. Properties that are characteristic of leather are porosity, water vapor absorption, initial tear strength, bending fatigue resistance, and deformation.

7700* Groundwood Mill White-Water Systems. K. H. Klemm. *Paper Trade Journal,* v. 142, Jan. 6, 1958, p. 30 + 3 pages.

(Translated from the German by G. P. Chinn.) Discusses water consumption, heat economy, white-water distribution, and slime control in white-water systems.

7701* Will Other Fibers Make Serious Inroads on Use of Wood for Pulp? Malcolm N. May, Irving H. Isenberg, and A. Neil McLeod. *Paper Trade Journal,* v. 142, Jan. 6, 1958, p. 36-40.

Discusses future possibilities for using cotton, bagasse, bamboo, straw, and glass fiber in papermaking.

7702* Refining Groundwood Fine Screen Rejects. K. H. Klemm. *Paper Trade Journal,* v. 142, Jan. 27, 1958, p. 30-34.

(Translated from the German by G. P. Chinn.) A survey of the principles and equipment available with performance data.

7703* The Measurement of pH in a Mill Sulphite Digester. L. N. Stanners and O. V. Ingruber. *Pulp and Paper Magazine of Canada,* v. 59, Jan. 1958, p. 89-93.

Describes the installation of a pH system on a mill digester and results obtained during conventional cooking operations. Such a system could probably be employed to improve control of the cooking process.

7704* The Distribution of Pore-Sizes in Wood-Pulp Fibres and Paper. T. S. McKnight, R. H. Marchessault, and S. G. Mason. *Pulp and Paper Magazine of Canada,* v. 59, Feb. 1958, p. 81-88.

The Hg porosimeter method for the determination of the pore-size distribution in a porous solid has been applied to laboratory handsheets made of unbleached kraft pulp.

7705 Review of Textile Progress. v. VIII. 611 p. 1956. Textile Institute, Manchester, England. (TS1449 R32 Vis.)

Physics and chemistry of fibrous materials; fiber and fabric production; analysis, testing, grading, and defects.

7706* The Migration of Salts in Leather. R. G. Mitton. *Society of Leather Trades' Chemists, Journal,* v. 41, Dec. 1957, p. 424-430.

The migration of salt is very dependent on the nature of the vegetable tan, and appears also to depend on the presence or absence of oil in the leather, nature of the salt, and whether conditions favor evaporation.

7707* Uncommon Inorganic Tannages. H. P. Chakravorty and H. E. Nursten. *Society of Leather Trades' Chemists, Journal,* v. 42, Jan. 1958, p. 2-22.

Information about the tanning power of 41 compounds.

See also: **6384** (intermediates in synthetic fiber manufacture); **7171** (pulp digester corrosion); **7629** (Lanon fiber).